THE DE BAY PROPELLER.

In our impression for Aug. 20th, 1880, we gave an account of the very successful results obtained with this propeller as fitted to the steamship Cora Maria, during a series of trials conducted in the presence of ourselves and a large number of experts at Cardiff last year. On the conclusion of these trials the ship left almost immediately for a voyage to Alexandria and the Danube, the results of which were summarised in a report by Mr. Hiscock, the engineer accompanying the ship on behalf of the De Bay Propeller Company, published by us in our num-ber for Dec. 17th, 1880. The consulting engineer to the com-nany Mr. Folkard M. Inst. C.E. who conducted the pany, Mr. Folkard, M. Inst. C.E., who conducted the Cardiff trials, found defects in the construction of the gearing for working the screws with which the Cora Maria was then fitted, and which we illustrated, arising from the haste with which it had been manufactured. from the haste with which it had been manufactured. To insure its completion in readiness for the trials on a stated day, the making of the upper and lower crank shafts had been intrusted to different firms, and no opportunity for testing the accuracy of the shafts was available until they were placed in the ship, and it was then found that they had not been accurately quartered. Under such conditions, although feeling confident the gearing would last through the first voyage, Mr. Folkard deemed it desirable that its action should be carefully watched and reported upon. The defects referred to were augmented by the working of the ship, and gave rise to augmented by the working of the ship, and gave rise to great delay and trouble during the voyage out and home, and the directors consequently determined on the prepara-tion of a simple form of gearing, to be ready by the time of the toothed wheels was quite smooth and uniform.

taken on board a very heavy cargo of coal—over 1700 tons—she put to sea from Cardiff on Sunday, the 6th instant. Her commander, Captain Cawley, reports that the weather was as heavy as anything known to him within his long experience, and, indeed, the gale of the succeeding days—the 7th and 8th—will long be remembered. Heavy seas washed the ship from stem to stern. the iron deck fittings and flooding the saloon and cabins. Through this severe test the De Bay propeller drove the ship without accident, and she anchored in the Thames on the 9th inst., and immediately went into dock to discharge. Mr. Folkard then examined the propeller, with which over 10,000 miles had been run, and pronounced i intact, and in as good order as when first fitted at Cardiff. He also reported that the gearing we have above described He also reported that the gearing we have above described had stood perfectly unaffected by the severe work to which it had been subjected during the stormy run of 600 miles from Cardiff to the Thames. Having thus been satisfied that the condition of the propeller and gearing was perfectly reliable, the 'directors of the company invited a large number of gentlemen connected with the engineering profession and shipping interests to be on board the Cora Maria during several hours' run on the Wednesday and Thursday of last week ; and we were present at that on the first-named day. the first-named day.

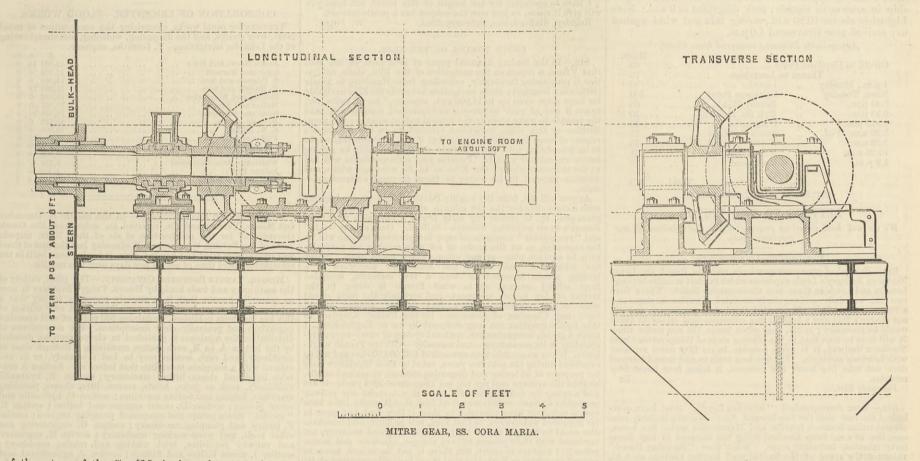
The action of the gearing was closely watched by an interested group of experts. From the moment of starting, and throughout the run, under all conditions of suddenly

cargo for Cette, near Marseilles, and we hope to hear that hervoyage fully confirms the opinion we have expressed

that her voyage fully confirms the opinion we have expressed as to the trustworthiness of her new gear. Of the propeller itself we have nothing fresh to report, save that its performance during voyages of between ten and twelve thousand miles, in exceptionally severe weather, has demonstrated the fallacy of the fear entertained as to its weakness. It has, indeed, proved itself to be all that its inventor, Mr. De Bay, has claimed for it. That gentle-man does not pretend that his present limited experience with it has enabled him to determine the best possible form and dimensions to be given, and we understand that form and dimensions to be given, and we understand that Mr. Folkard, as consulting engineer to the company, has recommended an additional foot of diameter being given to propellers to be fitted to vessels of such abnormally

coarse lines as those upon which the Cora Maria is built. We believe that it will not be long before the success of further voyages with the Cora Maria will remove the prejudice existing in the minds of marine engineers with respect to toothed gearing. That prejudice is a relic of the days of wooden teeth, and the strength now insured by the use of steel, such as has been employed in the gearing we have described, renders the continuance of such a prejudice unjustifiable.

We English engineers are continually reproached by we English engineers are continually reproached by our brethren on the other side of the Atlantic with our intense conservatism. It is hoped that that failing will not stand in the way of other shipowners following the excellent example set them by Messrs. Capper and Alexan-der, the owners of the Cora Maria. The directors of the De Bay Propeller Company and their consulting engineer, Mr. Folkard, have had to struggle against many diffi-



of the return of the Cora Maria from her second voyage to Bremerhaven. A design was accordingly prepared, which was approved by Mr. Folkard, and on the vessel's arrival in Cardiff the old gearing was at once removed and that now in use substituted. Our engraving represents that gearing.

At the end of the screw shaft tunnel was constructed a At the end of the screw shart tunnel was constructed a chamber with a measurement capacity of about 5 tons, in which was fitted the original gear, which nearly filled it. The same chamber has been utilised to hold the new gear, which is very much smaller. It consists of three mitre wheels cast in crucible steel by Messrs. Jessop, who now rank as perhaps the first founders of steel gearing in the world. On the solid shaft is keyed one wheel on the rank as perhaps the first founders of steel gearing in the world. On the solid shaft is keyed one wheel, on the hollow shaft of the other propeller is keyed the other wheel. These wheels are each 42in. in diameter on the outside pitch line, and they have each forty teeth 10in. long and 3'3in. pitch outside. Between the two is an intermediate mitre wheel which has forty-one teeth—the extra tooth being a "hunting cog"—and is 41in. in diameter. The wheel on the solid shaft causes the intermediate wheel to revolve, and it in turn drives the wheel on the hollow shaft in the opposite direction. Only one-half the whole shaft in the opposite direction. Only one-half the whole power of the engine is transmitted through the gearing, being of course absorbed by the propeller on the t. This is a circumstance which must not be lost solid shaft. This is a circumstance which must not be lost sight of. The intermediate wheel is keyed on a short shaft which revolves in two bearings, the outer being wider than the inner, which is rather cramped for room. Indeed the whole of the gearing would have been improved had the wheels been made a foot larger in diameter, which they might have been with ease; the desire to keep down weight, however, prevailed. The wheels were machine moulded and are perfect. It is of the utmost importance that in gear of this kind there shall be no shake or ricketiness-to use a most expressive word-so the whole of the gear in the Cora Maria is fixed on a very strong casting running fore and aft, and so bolted and secured to the ship that it forms part and parcel of herself. Not the slightest tremour was apparent in the framing when the gearing was transmitting about 290-horse power through it; the engines indicating double as much in the way already explained.

All being in readiness, and the Cora Maria having

Although running up to sixty-eight, and occasionally seventy, revolutions, the engines developing about 585-horse power, no jar or back-lash was perceptible; there was little or no vibration, and in the saloon, right over the gearing, no noise was heard, save the humming proper to well-made gearing running sweetly, which in no way prevented conversation being carried on. On deck there was an almost total absence of vibration or noise, and what little was due, in great measure, to the circumstance that the ship was empty. Flying light, as she was, she was as sonorous as a drum, and under the most unfavourable conditions for quietude; but the motion of the ship was more that of a sailing ship than a screw steamer. Time did not admit of trials of speed being run at the

measured mile in sufficiently deep water to compare the ship's speed performance with that at Cardiff ; but on the previous day Mr. Folkard had assured himself that there previous day Mr. Folkard had assured himself that there was no falling-off in that respect, as, also, that in spite of the newness of the gearing—which has not yet worked itself as free as it may ultimately be expected to do—the revolutions attained under a given pressure of steam showed a slight advantage gained in this respect over the abandoned form of gearing. We could detect no possible cause of failure as likely to arise under the contingencies of lengthened sea service, and we believe that the company may be congratulated on having overcome the difficulty. may be congratulated on having overcome the difficulty which alone militated against the complete success of the voyage to the Danube. It is right that we should point out that, even should an accident disable the gearing, the vessel is by no means helpless. On several occasions the screw driven by it has been disconnected, and the vessel, when fully laden, driven at a speed of seven knots with only the screw attached to the main shaft, the other, fixed to the hollow shaft, having been allowed to revolve by the vessel's way.

Mr. Hiscock's report of the voyage to which we have referred made mention of difficulty experienced in steering on the run to Alexandria. At that port he had the space at the top of the screw aperture left vacant owing to the diminished diameter of the De Bay propeller, as compared with the old screw, filled up; and we were assured that the steering was now all that could be desired. In turning the circle the small diameter of the curve traced was very satisfactory. The Cora Maria has now left with a

culties before the results we here lay before the public could be attained, and it is highly creditable to their energy and skill that, as these have arisen, they have been so successfully met and overcome. To Captain Cawley, also, as the pioneer captain on the trial of a new and much spoken-against invention, praise is due, and Mr. Hiscock's design of the details of the gearing we have illustrated does him much credit. The following copy of Mr. Hiscock's log will be found

interesting :

Sunday, February 6th.—Cora Maria left basin for London at 11.30 a.m., full-speed 11.45, left pilot at Laver-nock Point 12.0.; steam 70 lb., rev. 58. Some other steamers leaving before and at the same time with us are left far behind. The Greta, another of Capper's vessels left far behind. The Greta, another of Capper's vessels which left Penarth considerably before us, and which the mate tells me has raced and beaten the George Fisher, is being gradually overtaken, and at 5 p.m. is passed. Our second engineer was appointed by Mr. Flannery as chief to the Greta yesterday, and the second engineer engaged to fill his place by Scott has failed to turn up. Mr. Scott, however, decided to sail with only the third, and to take watch and watch with him, otherwise the ship would have been detained at least another day. 6. p.m.: Lundy Island abeam and Hartland Point at 6.30; 10 knots with the The wind now begins to freshen from the S.W., the tide. glass is falling, and the sky shows signs of a coming storm. As the night advances the wind rises, and the air is getting thick. If it should blow very hard before we reach the Longships it will make it hard work to get down and round the corner.

Monday, February 7th. - Nasty thick and heavy weather, impossible to see any distance, and from 3 a.m. proceed very slowly, just keeping her before the head wind and sea. Sighted the Longships just before daylight, almost abeam, engines turning slowly to keep steerage way, as we pitch into the seas which rush roaring and hissing past us. Proceed in this way all the morning till Wolf Rock is passed shortly before noon, seen occasionally through the blinding spray and rain, then turning slowly round on the easterly course, come in for considerable share of heavy rolling and pitching. At 4 p.m. estimate to be off the Lizards, but keeping well out into channel so as to be clear of the land. At 6 p.m. weather clearing, but

wind blowing very hard ; proceed at full speed once more, with heavy seas rolling after us, and in this way the night wears on and the wind still increases and the glass still falls. Gearing is working very well, gradually getting smoother or softer in sound, and the governor is working well also.

Tuesday, February 8th.—Blowing fearfully all the early morning, and seas tremendous, filling the main deck level with the bulwarks, bending stanchions, and pitching down into stokehole. Captain at one time contemplating turning herround and running before the sea. Continue on, however, at full speed well out in mid Channel far from all sight of land. Noon, estimate abeam of St. Catherine's Point, and course is altered to bring us up nearer to land. This brings the sea on our port quarter, and increases the pitching and rolling, steering wildly and shipping seas down stokehole, breaking away stanchions, pouring tons of water into main deck, breaking wrought iron covering plates over winch pipes, gratings, &c., lifting the cover of after skylight and flooding us out of the cabin. 6 p.m.: At last the welcome sight of lights along the coast, which turn out to be those of Brighton, then Beachy Head, abeam at 7.45. Royal Sovereign Lightship at 9.15, and wind and sea moderating considerably; governor is taken out of gear. It has been a severe test for the new propeller blades and the new gearing; but everything has stood the test splendidly. Dungeness abeam at 12.15 midnight, and shortly after took pilot on board, proceeding in 20 minutes, 59 to 60 rev., steam 73 lb.

Wednesday, February 9th.—South Foreland abeam 3.30, North Foreland 5.30, blowing hard from the N.W. strong head wind. Stopped about 15 minutes at Girdler Lightship in answer to signals; took diagrams at 9 a.m.; Nore Lightship abeam 10.20 a.m., strong tide and wind against us; arrived near Gravesend 1.0 p.m.

Approximate Distances measured from Chart.

Contrain of Alter Dies	au rom	.t	 	 65
Th	ence to	Longships	 	 76
p.m., Monday	"	Lizard	 	 32
Noon, Tuesday		Caithness Point	 ·	 160
7.45 p.m.		Beachy Head		
).15 p.m.	,,	Ryl. So. Lightsh		
12.15 mid.	22	Dungeness	 	 24
3.30 a.m. Wed.	33	South Foreland		21
5.30 a.m.	22	North Foreland		16
0.20 a.m.	,,	Nore Lightship		
L.0 p.m.	2.2	Gravesend		18

Total ... 519

LETTERS TO THE EDITOR.

We do not hold ourselves responsible for the opinions of our correspondents.

HIGH-SPEED LOCOMOTIVES.

HIGH-SPEED LOCOMOTIVES. SIR,—Several of your correspondents seem to forget the Great Northern Railway's Leeds expresses which ran last summer between London and Leeds in three and three-quarter hours. There were two each way daily, and regularly consisted of twelve carriages and a Pullman car. They also carried third-class passengers, and did not charge a fare and a-half, as one correspondent seems to think would be necessary ; la.tly, they often made the run under time. It will thus be seen that in the existing state of things on the Great Northern Railway, it is quite possible to do fifty miles an hour with fourteen carriages. The quickest train to and from Liverpool does not take five hours five minutes, it takes four hours fifty minutes. D. minutes.

February 21st.

February 21st. SIR,—Your correspondent "Running Board" must have over-looked the fact that the London and North-Western Railway runs several trains between London and Manchester under five hours, one, the 10 a.m. from London, doing the distance in four hours forty minutes, including stops. What does "Running Board" think of the speed of the limited mail leaving Carlisle at 8.46, arriving at Preston 10.52, stopping for a few minutes at Carnforth, and this over a heavy line? I could name a great number of trains guite equal to the Great Western crack, with quite as old engines. One instance : on the Caledonian Railway all their engines, Nos. 76 to 87, are quite as old, and they run at a high speed ; one train, the 10 a.m. from London, they take from Carlisle to Beattock, forty miles in fifty minutes, and this for a considerable distance on a rising gradient. On the North-British line there is one train, viz., the 7.10 p.m. from Edinburgh runs to Cowlars, a distance of forty-six miles, in sixty-two minutes, stopping at Polmont. I have no doubt but that there are many more examples to be found. 114, West-street, Glasgow, February 21st. ERNEST SMITH.

ANTHRACITE AS A HOUSE COAL.

ANTHRACITE AS A HOUSE COAL. SIR,—I have read with interest your editorial article of the 18th inst. upon this subject, and as you appear to wish to ventilate the question, perhaps you will not think I am presuming too much in asking space for a few remarks respecting it when I tell you I have burnt this coal for nearly thirty years in kitchen ranges and open fireplaces for dining-room, drawing-room, and bed-rooms. My kitchen fire has not been out for twelve and eighteen months at a time. The chimneys scarcely ever required sweeping, and when they were, there was no soot, only a little dust. In America this coal was for years the only fuel of the country, and now it is very largely used for domestic and every other purpose.

and now it is very largely used for domestic and every other purpose. It is broken up by machinery to the proper size for household purposes. Also in Kilkenny, in Ireland—where it is found in con-siderable quantities—carts stand in the market with broken coal for the same purpose ; but the Welsh anthracite proprietors appear only just to have realised this important feature for promoting the use of this sort of coal as a domestic fuel. The coal can be burnt in most fire-places with ordinary draught, but of course "smokeless coal" will not cure "smoky chimneys," and where combustion is taking place, gases are liberated that require to be carried off and there is no help in this respect for a chimney with a persistent down draught instead of the reverse. At the late exhibition at the Alexandra Palace the best Carmarthenshire anthracite coal was used. Not the coals you mentioned, which are not anthracite at all, but what are known as the "Welsh smokeless steam coal." In Wales there are found three descriptions of coals, viz.: "Bituminous," "semi-bitumi-nous," and "anthracite;" of the former we need say nothing, as that is not under discussion. The "semi-bituminous" is an inter-mediate coal between "bituminous" and "anthracite;" it is gene-rally nearly smokeless, and known, as before stated, as the 'Welsh smokeless steam coal." It is not as hard as anthracite, and will not stand the weather or knocking about as well.

raily hearly shokeless, and known, as before stated, as the "wear smokeless steam coal." It is not as hard as anthracite, and will not stand the weather or knocking about as well. "Anthracite" proper is perfectly smokeless, and cannot be made to smoke under any circumstances, and is bright, hard, and black in the fracture. Large quantities of the best description of anthracite are found in Pembrokeshire containing from 93 to 94 per cent. of carbon, which I believe is the highest percentage known. But the most

extensive anthracite measures are in Carmarthenshire and part of Glamorganshire, running up the Gwendrath Valley from Bury Port on to the Loughor Valley, and also up the Swansea and Annan Valley, some fifteen or twenty miles. Many of the veins in these districts are of the best description of anthracite coal. The harder and purer the anthracite the less it decrepitates from the action of the weather or moving about ; and I know of several large pieces that have been exposed to all weathers, summer and winter for the last twenty or twenty-five years, that are as large and hard now as when first brought to the surface. In the anthracite districts the small, or culm, as it is locally called, is used for domestic purposes, as you say, mixed with clay, by the rich as well as the poor. The kitchen fires are generally made up very artistically and look very pretty ; but I have always seen it used in a wet state, and not dried as you state, unless made into the shape of a special fuel with other ingredients. The quantity of small that would be made from coal properly broken beforehand would be very triffing, and could be easily used for making a slow fire to be kept in for some time without attention. My opinion is that the difficulty in getting this coal used in London for domestic purposes lies more in overcoming the preju-dice against it and the description of fire it makes than in the difficulty of burning it. Londoners must have a large blazing fire, and one that they can poke and stir about, which this will not stand. To burn this coal properly and economically it should be left after once made up for some hours, merely cleaning the bottom occasionally of any dust, and it will burn away to nothing. It will soon be found by practice that it does not require to be a large fire or none at all, but it can be regulated if properly manged. In regard to the damage to the furniture, I did not find mine injured in any of my rooms, and the only way I can account for

In regard to the damage to the furniture, I did not find mine injured in any of my rooms, and the only way I can account for the damage you speak of is that the chimney did not carry off the gases as alluded to before. A "blower" is recommended for first lighting a fire, but should be used very little, as it quickly exhausts the strength of the coal; but I do not altogether see that its recom-mendation condemns the fuel, as a "blower" is in very general use in the Miidland Counties—say, Staffordshire, Lancashire, and Derbyshire—and is no novelty. I have to apologise for the length of this letter, but hope you will give it space, as just now the subject has a public interest. Rugeley, Staffordshire, February 22nd. W. FOLEY.

CHAIN TOWING ON THE ELBE.

CHAIN TOWING ON THE ELBE. SIR,—In the leading financial paper of 19th inst. we are told that "from a report on the navigation of the Elbe, chain naviga-tion is progressing favourably, extending from Hamburg to Aussiz (Bohemian frontier); chain navigation has made the Elbe navigable for large ships even up to 14,000 cwt. capacity," &c. I write, Sir, to ask if any of your numerous, well-informed readers will take the trouble to make plain to the general public what are the pecu-liarities of this chain navigation referred to in the *Economist's résumé* of news from Germany, so that if it is a system that ought to be introduced into Great Britain we may speedily be getting better acquainted with it. Perhaps your correspondents will tell us the characteristics of the Elbe as to its windings, width, and whether stopped in its course by those frequent obstructions— weirs.

us the characteristics of the Elbe as to its windings, width, and whether stopped in its course by those frequent obstructions— weirs. As you will see, from the locality I date at, that we are hugging with a close embrace the pet scheme of not a few enthusiasts in years gone by, to render our dirty Irwell a navigable river from Runcorn to an adjoining borough—Salford. One of our "safe" and "respectable" newspapers says the proposed scheme will be too expensive, so on the motto of *nil desperandum* we naturally turn to another plan—or any other—which opens itself. About the middle of last month the *Manchester Guardian* in a leading article favoured us with a few statistics, compiled from official sources, as to what France is doing in the matter of her inland transport, and certainly the facts stated were of so startling import that in my opinion should force any Chamber of Commerce in the United Kingdom to take up the question too long deferred by us as Englishmen. I mean a grand, comprehensive, national system of water-ways corre-sponding in its earnestness—and necessity—with our French neigh-bours. When we are told that upwards of £60,000,000 has and will be expended during the next few years, voted by their legislative body for purposes of widening and deepening streams, rivers and canals, so that the average cost per ton per kilometre—1064 yards—is but s of a penny for merchandise, &c., does it not strike our railway promoters of many roundabout rival lines that it would have been money infinitely wiser expended by them if they had but gone in for improved water-ways, so that food, raw products and merchan-dise could be brought to our busy centres of inland industry, not burdened with their present railway charges, exactions and mono-polies? I venture to assert, Sir, there is not an inland town in either Lancashire or Yorkshire that is not inwardly groaning at its railway interest of this country is nearly omnipotent; but if to become so it has and is devouring what small profits are yet lingering to a

AGRICULTURAL ENGINES AT THE MELBOURNE EXHIBITION. SIR,-We think the following statements will remove the doubts SIR,—We think the following statements will remove the doubts which are expressed in your paper of 18th February as to the award of the jurors to our engines at the Melbourne Exhibition — We shipped by the Sorata for the Exhibition one 8-horse power portable engine, one vertical engine, and one thrashing machine. The Sorata went ashore near Adelaide on September 3rd. The Orient Company, for whom she was sailing, could tell nothing about the salvage until the 28th October, and even then they could not tell whether our goods were saved or not. On the 6th November, reaching us December 8th, our represen-tative at Melbourne wrote us that our engines by the Sorata had been saved and sent forward to Melbourne; that the vertical was in the Evhibition and that the Schere rever portable was height.

in the Exhibition, and that the 8-horse power portable was being

in the Exhibition, and that the S-horse power portable was being refitted and renovated. On the 30th November—reaching us January 10th—hc wrote us that the portable was also in the exhibition and our stand complete. On the 1st February our representative telegraphed us that the S-horse power portable engine was awarded a first prize. On the 3rd February he telegraphed us that the vertical engine was awarded a first prize. The Melbourne Leader of October 23rd stated what was known there on that date, where it was supposed that none of the heavy packages ex Sorata could be saved, and in England nothing was known to the contrary.

known to the contrary. But these statements did not reach England until December 7th, and have clearly nothing to do with the *Times* telegram of November 2nd November 2nd.

[Copy of "The Times" Telegram, November 2nd, 1880.] Melbourne International Exhibition.—The following is the official report of the first list of awards made by the Commissioners in the various classes at Melbourne :—Agricultural implements : Crowley and Co., Sheffield and Manchester, gold medal. Air-compressing engines : W. Turner and Co., Salford, silver medal. Art pottery : Howell, James, and Co., London, gold medal. Bicycles :

Sparrow, London, silver medal. Billiard tables: Turner and Price, London, gold medal. Cabinet work: Gillow and Co., London, gold and silver medals. Carriages: Morgan and Co., London, two gold medals. Carpets: Lapworth Brothers, London, gold medal. Chandeliers: Earl and Philp, London, gold and silver medals. Electro-plate: Yates and Sons, Birmingham. Engines (Agricultural): Ransomes, Sims, and Head Ipswich, gold medal. Smoke-consuming appliances: W. Addis, London, silver medal. Pianos: Brinsmead, London, gold medal. This telegram was contradicted in the same papers for days

This telegram was contradicted in the same paper a few days after it appeared. We have no knowledge as to its origin, or how it reached the *Times*, and if you can discover this you will render

it reached the *Times*, and if you can discover this you will render the public a service. The thrashing machine by the Sorato being too much injured to be restored was left in the hands of the underwriter's agents. The thrashing machine we have in the exhibition was purchased from the stock of Messrs. T. Robinson and Co., of Melbourne, to whom we had supplied it in the ordinary course of business. Ipswich, February 23rd. RANSOMES, HEAD, AND JEFFERIES.

THE USE OF SAFETY VALVES. SIR,—Do you think that a safety valve to a boiler—taking usage, practice, and judgment in relation to it—was ever intended to carry off the steam generated in a boiler under sharp firing, every stop valve and other means of escape being screwed down on the boiler? INQUIRER. February 23rd.

The question raised by our correspondent is so important that we publish it. Our own opinion is that the safety valves on a boiler ought to be able to keep pressure down to safe limits under all conditions of firing; but we fear that this rule is very seldom observed. The eliciting of a number of opinions on this subject from practical boiler-makers and engineers can hardly fail to do good.—ED. E.]

TENDER.

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CORPORATION OF LEICESTER.-FLOOD WORKS. TENDERS for canal works, comprising the construction of canal locks, weir sluices, and the deepening, widening, and straightening of the Leicester navigation. T. Griffiths, engineer.

James Neave and Sons		 	 			12,904	18	0
Cook and Burnett		 	 			12,262	0	0
S. Pearson and Son		 	 			11,566	0	0
R. Moffatt and Son		 	 			11,090	11	2
Beuton and Woodiwiss		 	 			10,852	0	0
Holme and King		 				10,797	0	0
Scott and Edwards		 	 		-	10,568		3
B. Cook and Co						10:433		0
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THE PRESENCE IN CONTRACTOR	•••	 	 	••	•••	10,000	~	~

RAPID TORPEDO BOAT BUILDING.—In the middle of December last Messrs. Yarrow and Co. received an order from the Greek Government for the construction of six of their 100ft. torpedo boats of the Batoum type, and on Wednesday last the first of these was successfully tried and handed over, it having been built in the remarkably short time of only a few days over two months.

remarkably short time of only a few days over two months. MESSRS. TANGYE BROTHERS' CATALOGUE.—The great variety of the machinery and tools made by Messrs. Tangye Brothers is now so generally known, that it is scarcely necessary to say that a catalogue of their productions is no small book. A new edition of this has just been published, containing 380 pages of well executed engravings and generally clear descriptions. For convenience of distribution the catalogue is published in eleven sections denoted by the letters A to K, each section containing a distinct class of machinery, and each section may be had separately, or in one volume with a complete index like that before us. Section A con-tains hand and steam lifting machinery ; section B, hydraulic machinery, such as jacks, hoists, cranes, lifts, shears, punching machines, forging and testing machines ; section C, hydraulic and screw presses ; section D, steam engines and boilers ; section F, "special" steam pumps and compound pumping engines ; section F, pumps and pumping machinery ; section G, engineering and other tools, and wood-working machinery ; section H, engineers' and railway requisites, brick making and mining machinery ; section I, steam boilers and fittings ; section J, agricultural and colonial machinery ; and sections K, specialities for gasworks. In sections H and J there are machines which Messrs. Tangye, we need hardly say, do not make, but which, having made a good selection, they supply for the convenience of customers purchasing other machinery. In sections D, F, and G we notice several new and well-designed engines, machines, and tools, but we must not commence o tdiscuss these or we shall require much more room than is at our disposal. The catalogue throughout is carefully prepared and is well printed, and evidently at great cost. It is a pity, therefore, that for the want of a little lettering on the back, the catalogue will in many offices and libraries be found with difficulty when wanted. A large numb MESSRS. TANGYE BROTHERS' CATALOGUE.-The great variety of

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containery, they state that their business has steadily increased during the past four or five years.
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containery, they state that their business has steadily increased during the past four of the new edition of the increase in the yearly production and export of iron and steel from the data given it appears that the production of each year. From the data given it appears that the production of (78,417 tons in 1830, to 7,200,000 tons in 1880, the largest production production to for on in the United Kingdom increased from 678,417 tons in 1830, to 7,200,000 tons in 1880, the largest production production of the exports of iron and steel in 1830 amounted to 117,135 tons, and increased each year, almost without break, excepting during the crimean war, in 1854, and they reached 2,224,470 tons in 1876, at about which lever eached 2,370,884 tons; intil 1872, when they reached 2,370,884 tons; intil in 1870 it averaged for the first half-year £10 per ton; in 1872, and again in 1873, the price once more reached £17 10s, per ton, and by the autumn of 1879 it had fallen to £4 13s. per ton, and by the autumn of 1879 it had fallen to £4 13s. per ton, and in 1845 it was nearly £5 10s, per ton. In 1880 it further rose to 73s. 6d., from which point it soon fell, and during the last six months has remained steady, with fluctuations of not more than 4s. A better idea of the fluctuations in the iron trade can be obtained in a few minutes from this chart

RAILWAY MATTERS.

THE Furness Railway Company has determined to commence the erection of the new general passenger station at Barrow, and also to proceed with the construction of the Park Loop Line, about four miles in length, by which the town will be placed on the main line of the Furness Railway.

main line of the Furness Railway. THE arbitrators to whom some of the matters in dispute between the St. Gothard Company and the contractors for the tunnel have been referred, have decided that the cost of reconstructing that part of the tunnel which has so frequently fallen in and delayed its completion must be borne by the company. A CORRESPONDENT of the *Times* writes that attention has lately been called to the abrupt cessation of the Candahar railway works. They were stopped without a day's notice, and 7000 workmen were suddenly dismissed to their homes, thereby causing a panic along the line. Luckily no ill effects followed. Had the Marris not been effectually cowed the results might have been serious. A yrew line has been completed in Norway between Hamar and

A NEW line has been completed in Norway between Hamar and Eidswold, a distance of 58 kilometres. The line completes the Endswold, a distance of 58 kilometres. The line completes the direct communication between Christiania and Trondhjem, and thus forms part of a line 560 kilometres in length. The gauge of the new line is 1 '067 metres, the whole of the older part being of 1 '435 gauge. The cost of the new line has been seven and a-half millions of francs.

THE Melbourne Argus, in commenting on the near approach to each other of the termini of the railway systems of New South Wales and Victoria, regrets that, with the last rail separating the two cities of Melbourne and Sydney nearly laid, no arrangement has been come to as to which colony shall be the builder of a bridge over the Murray, the width of which will very shortly be the only break in the whole 600 miles dividing the capitals of the two colonies colonies.

colones. THE half-yearly report of the Great Northern Railway, adopted at the meeting on Friday last, states that in the locomotive depart-ment the accounts showed an increase of £11,840, chiefly due to the increased mileage of 699,890 miles and the opening of new lines. The cost per train mile had been 9'49d., against 10'06d. in 1879, which was equal to a gain of £17,480. The average age of engines over the whole stock was seven years, and carriages eight and a-half years, and of wagons eight and a-quarter years. They had fitted 90'15 per cent. of the passenger engines with continuous brakes, 88'21 per cent. of tenders, and 85'77 per cent. of carriages. VERV considerable additions have been made to the rolling stock

had noted 35 per cent. of tenders, and 85 77 per cent. of carriages. VERY considerable additions have been made to the rolling stock of the London and North-Western Railway during the last six months. From an official tabular statement it appears that the company now owns not less than 2182 locomotives and 1587 tenders, 1608 first-class and composite carriages, 253 second-class and 1334 third-class carriages, 28 travelling post-offices and tenders, 554 horse-boxes, 608 carriage trucks, and 645 guard, brake, and parcel vans. In addition, it owns over 45,500 merchandise and mineral wagons, including 962 it has added during the year. It is proposed to make a larger addition during the half-year now entered upon. THE new Scarborough and Whitby Railway Company have invited a public subscription of £145,000 on 5 per cent, preference shares, with participation in surplus profits. The land has already been purchased and paid for, and the earthworks and bridges constructed, and the whole railway is expected to be ready for traffic in a year's time. The line will form a very important link in the chain of railway running along our coasts. It will complete a new and improved connection between Middlesbrough, Whitby, Scarborough, and Hull. It deserves support on its merits, and also because, from the facilities afforded for concen-trating troops at any place, such lines are of national importance, WE understand that Messrs. Ward, Ross, and Liddelow, railway trating troops at any place, such lines are of national importance, WE understand that Messrs. Ward, Ross, and Liddelow, railway contractors, of Glasgow and Workington, have arranged with the Furness Railway Company for the construction of their Park Loop Line, near Barrow-in-Furness, which will be commenced imme-diately. The same firm is carrying out the lines on the west coast for the Cleator and Workington Railway Company. The main line from Cleator to Workington has been open about twelve months, and is developing a very large traffic from the iron ore mines to the furnaces on the coast. The Rourah branch, the works are of a heavy description ; two cuttings near the summit about half a mile long each, and entirely through the sandstone rock at nearly 50ft. deep, are nearly completed, and the line is expected to be open for traffic in the course of the summer.

MAJOR MARINDIN, Board of Trade inspector, opened an inquiry at Annan, on Monday afternoon, into the Solway-viaduct disaster. Mr. Brown, resident engineer for the Solway Junction Railway, said that in the winter of 1875 over thirty piles were cracked by the frost, but these were still standing. On the 29th of last month the bridge was damaged by floes of ice, which dashed against the piers with a noise that could be heard a mile off. Three "rakers" were broken on that day, and a passenger train due at the time was piers with a noise that could be heard a mile off. Three "rakers" were broken on that day, and a passenger train due at the time was stopped for two hours. Eventually that train and three others were allowed to proceed slowly across the bridge. Next day the destruction of the piers continued, and by the 2nd February 340 pillars had been broken. Evidence was given as to the exceptional quantity of ice that had been floating in the Solway this year, and the inquiry was adjourned.

the inquiry was adjourned. OUR agricultural contemporary, the Mark Lane Express, has been very energetically placing before its readers a lot of informa-tion concerning agricultural produce on railways. After a thorough examination of the law of the question, it has now begun to deal with the rates for carriage charged by particular companies, the South-Western being the first selected, and by which it says :— "Immense sums have been illegally extracted from the public," and those who have paid in excess of the maximum rate are in-formed that they can recover the overcharges for six years past. After examining the Acts of the company, our contemporary comes to the conclusion that it is only authorised to charge 5d. per ton per-mile for milk, and that it often charges in excess of this rate from 700 per cent, downward. In regard to the charges for the carriage of manure, the overcharge on short distances is from 200 to 400 per cent, and the least overcharges is for a distance of just over fifty miles, when the company charges just half as much agin as it is entitled to. again as it is entitled to.

In reference to the relative value of steel rails and iron rails, In reference to the relative value of steel rails and iron rails, the following remarks of the chairman at the shareholders' meet-ing of the North-Western Railway on Saturday are worth reproducing :—"They had nearly completed the whole of the work of relaying the road with steel rails both on the main line and branches, and they were deriving very great benefit this half-year from the economy which the introduction of the steel rail had produced. Going back to 1874, he found that the cost of relaying the line was £454,000 for materials alone, while in 1880 the total cost of relaying the line had been only £176,000. No doubt a very considerable portion of this difference was owing to the change in one that was 150,000 to match and 1600. No doubt a very considerable portion of this difference was owing to the change in the cost of relaying the line had been only £176,000. No doubt a very considerable portion of this difference was owing to the change in the cost of the rails. Formerly the cost was much larger, but the average cost in the past half-year was £4 18s. 6d. per ton. When, however, they came to compare the number of miles relaid, he found that about 1875 and so forward they laid from 211 to 220 miles each year, whereas last year they had only needed to relay 150 miles. The question was, how long would that continue? He believed he told them once before that this year and last year were somewhere about an average of the future, but they did not feel very clear on that point, and they required a little more experi-ence on the matter. He once told them that they put down some rails which weighed 841b. to the yard, and they took them up at the end of sixteen years, when they weighed 59 lb., but since then they had taken up some which weighed only 51 lb. They never had any iron rails which wore away to a lower point than 741b., so that, although the steel rails were lasting longer, they were wearing a certain quantity away each year; and they had there-fore considered it prudent not to bring into division in the revenue the profit they made on the old rails a year ago."

NOTES AND MEMORANDA.

At Winnipeg the thermometer recently registered 15 deg. to $33\deg$ below zero, the Colonies and India says, for seven consecutive days.

An avalanche, another to be added to the many of 1880-1, fell on the 20th on Villaron, in Savoy, crushing several houses and killing many cattle, but the inhabitants escaped.

At Adelaide it is stated that, on Christmas Day, the thermometer stood at 110 deg. in the shade and 160 deg. in the sun. Twenty-four hours afterwards it dropped to 50 deg. On December 29th the thermometer stood at a still higher figure, and there was a fall of more than 60 deg. before the following night.

Some excavations commenced at the distance of about a kilo some excavations commenced at one distance of about a known metre from the walls of Pompeii, with a view to assortianing the nature of the surroundings of the city, have led to the discovery, within an area of but a few square metres, of thirty skeletons, ten of which were huddled together in one room of a small suburban villa, and among and upon the bones were found bracelets, neck-laces, earrings, and other objects of the kind.

laces, earrings, and other objects of the kind. THE village of Brevieres, in Savoy, has been completely de-stroyed by two avalanches. The first occurred on the 13th inst., when twenty-two persons were buried with the houses in the snow. Eleven were saved, four were found dead, and five have not yet been recovered. There was no hope of recovering them alive. The second avalanche has destroyed what remained of the village. Thirty-six persons were buried beneath 45ft. to 60ft. of snow, covering 10,000 square yards. Of these twenty-seven have been rescued living, and six dead. Three have not yet been recovered. The losses are estimated at 250,000f.

The losses are estimated at 250,000f. It is well known that ordinary letter paper if rubbed acquires electric properties. M. Wideman, has, however, says the *Electricican*, found that if one takes Swedish filter paper, or this paper laid between pieces of letter paper, and subjects it to the following treatment, it displays strong electric properties, and sparks several centimetres in length can be obtained. The paper should be plunged into a mixture of nitric acid and sulphuric acid of equal volume. The paper thus pyroxilised is then washed in plenty of water and dried. Then rub quickly, having stretched it on a waxed cloth, in order to give it electric properties. Nearly every experiment with static electricity can be accomplished with the paper.

In the early future india-rubber ought not to be an expensive In the early future india-rubber ought not to be an expensive article. According to information concerning the plant which pro-duces Ceara-rubber, contained in the report on india-rubber by Dr. H. Trimen, of Ceylon, the plant is very hardy, and will grow in a dry, rough soil, and a moderately dry, hot atmosphere, while the Para and West India rubber plants require a rich alluvial soil, and a constantly hot-moist atmosphere. Ceara-rubber plants have been found to succeed in Ceylon, Calcutta, and Madras, but the climate of Singapore is too wet for them. It is suggested, says the *Journal* of the Society of Arts, that plantations should be formed on exhausted coffee land. The tree grows to about 30ft. or more in height, and forms a dense rounded crown. It attains a diameter of 4in. or 5in. in about two years, when it may be tapped. M. HENRI MATHIEW, in his recent address to the Paris Société

diameter of 4in. or 5in. in about two years, when it may be tapped. M. HENRI MATHIEW, in his recent address to the Paris Société des Ingenieurs Civils, referred to the works of deceased eminent members, and mentioned that M. Marc Sequin as the engineer of the first wire rope suspension bridge which was constructed in 1820 at Tournon, on the Rhone, and said that four hundred bridges on the same principle are now existing. M. Sequin, he also said, was the inventor of the tubular boiler, which he used on a steamboat on the Rhone, and afterwards applied to locomotives in about the year 1827. The brothers Sequin were the concessionaires for the St. Etienne and Lyons Railway, among others, and M. Mathiew referred to them as the founders of the French civil engineering profession. Benoit Fourneyron, the inventor of the Fourneyron turbine, is credited with playing a very important part among the great in the profession. great in the profession.

great in the profession. At a meeting of the Chemical Society on the 20th ult. a paper was read on a "New Theory of the Conversion of Bar Iron into Steel by the Cementation Process," by Mr. R. Sydney Marsden, D.Sc. The author first referred to a former paper of his in the "Proceedings" of the Royal Society of Edinburgh, Vol. X., p. 712, in which he had shown that when amorphous carbon in an im-palpable powder is kept in contact with porcelain at a temperature considerably above redness, but not sufficient for the latter to become fused, the carbon will, if left for a number of hours, diffuse into the porcelain and ultimately permeate it throughout. He considers the conversion of bar iron into steel by the cementation process as analogous to this—that is to say, the result of diffusion of carbon in an impalpable powder into the bars of iron whilst they are in an expanded and softened state. Silicon also appears to be present in the amorphous condition, and to diffuse through iron in a similar manner. in a similar manner.

in a similar manner. A NEW material named "tripolith" is being made by Messrs. Schenk Brothers, of Zurich. For some years the Prussian Ministry has encouraged the production of a cement or plaster, which will be stronger than plaster of Paris, but of a better colour than Portland cement, a material to take a place between these for plastering and all kinds of ornamental purposes. The material made by Messrs. Schenk is said to be of a slightly warmer tone than the gypsum plaster, while it is also said to set more rapidly, be of less weight in the cast (though it should be mentioned that it is admittedly heavier before mixed with water, east, and dried), and of about 100 per cent. greater strength. It will stand washing with soap and lye, and becomes very hard with age, especially when coated with oil paint. As a material for the plaster fronts of houses, for which purpose plaster is so largely used in many German towns, it would seem to present the most desirable quality of being unaffected by exposure to the weather. It is used, as recommended by the inventors, either with an equal quantity of fine sand, or, one of tripolith, one lime, and one fine sand; or one of stand, or, one of tripolith, one line, and one fine sand; or one of tripolith to two of coarse washed river sand; or one tripolith to one lime. For water and fire-proof coatings, the first and third of these mixtures are especially recommended.

these mixtures are especially recommended. In writing to a daily contemporary on the very high tide or rather high water in the Thames on the 18th ult., Sir Joseph Bazalgette, in reply to a communication by Mr. Manning, engineer to the East and West India Dock Company, states that immediately after the occurrence of the high tide of the 18th ult., he had observations of its level recorded in fifteen different parts of the river, by reliable and responsible officers and surveyors of the Board, well accustomed to taking such observations, with the following results :--Height above Trinity high-water mark : Woolwich, 4ft. 04in.; Greenwich, 4ft. 8½in.; Lower Shadwell, 5ft.; Charing-cross, Pier, 4ft. 11½in.; Westminster Bridge Stairs, 4ft. 9½in.; Freeman's Wharf, Millbank-street, 4ft. 9½in.; Sunderland Cement Wharf, 4ft. 9¼in.; Draw Dock. Lambeth Bridge, 4ft. 8½in.; Pumping Station, Effra Creek, street, 4ft. 9¼in.; Sunderland Cement Wharf, 4ft. 9¼in.; Draw Dock, Lambeth Bridge, 4ft. 8½in.; Pumping Station, Efra Creek, 4ft. 9in.; Western Pumping Station, Grosvenor-road, 4ft. 9in.; Battersea Church, 4ft. 10in.; Falcon Creek, 5ft.; "Crab Tree," Hammersmith, 4ft. 5in.; Hammersmith Creek, 4ft. 6in.; Chiswick Mall, 4ft. 6in. Mr. Manning's observations illustrate the well-known fact that the high water of any tide is, as a rule, not of an uniform level in all parts of the river ; and that there are disturbing causes which even reverse the relative altitudes of high-water in different parts of the river, being at one time, as he shows, 2¼in. higher, and at another 1¼in. lower, at the East India Dock than at Limehouse. But on the 18th of January last the wind was blowing from the east and east-north-east with amaximum pressure of 51.5 lb. from the east and east-north-east with a maximum pressure of 51 bit. per square foot, and with a horizontal movement of 806 miles per diem. Under those conditions the entrance to the West India Docks was protected by the land, while on the lee shores the obser-vations generally record greater altitudes. It must be presumed that either this 860 miles per day is insufficient or the pressure 51 5 is much too high, unless 860 miles is to be taken as the total movement in a very gusty day.

MISCELLANEA.

THE Royal Exchange, it is expected, will be shortly roofed in with glass

A COMPANY has been registered to manufacture the Fitzgerald dynamo-electric machines and lamps.

APPLICATIONS for space, and other demands of those who intend exhibiting at the International Exhibition of Electricité, must be made before the 31st March to M. Georges Berger, Paris.

THERE are now in the City of London 467 hydrants for street cleansing purposes erected at a cost of £6738, and it has been resolved to cleanse certain asphalted streets by means of these hydrants.

SIR JOSEPH BAZALGETTE has been instructed by the Metropolitan Board of Works to proceed with all possible dispatch in the pre-parations in plans of works necessary to protect the Lambeth district from overflow of the river.

THE question of unit ing the waters of Lake Superior and the Red River by means of a canal has been discussed in the Chamber of Commerce of Duluth, and a resolution passed recommending an appropriation of public money for the purpose of a complete suprov survey.

THE Army and Navy Gazette states that Rear-Admiral Edward Howard has been selected for the post of vice-president of the new Ordnance Committee about to be formed, and Captain Morgan Singer and Captain Cyprian Bridge will be the other naval members members.

THE calendar published by the Sanitary Institute of Great Britain, the offices of which are at 9, Conduit-street, Regent-street, W., contains amongst other things a syllabus of subjects for the voluntary examination of local surveyors and inspectors of nuisances. The questions presented in the 1880 examinations are also given also given.

THE second Building Exhibition of Architecture, Construction, Engineering, Decoration, and Furniture, is to be held in the Agri-cultural Hall, Islington, in April, from the 4th to the 16th. Applications for space to be sent to the secretary and manager, Mr. John Black, 161, Strand, London, W.C. Articles for exhibi-tion will be received at the hall on April 1st and 2nd.

A RETURN by the treasurer of Liverpool shows the enormous growth of the assessable value of all property in that city. During the past twenty years it has developed from $\pounds 2,035,744$ in 1860 to $\pounds 2,692,147$ in 1870, and $\pounds 3,296,342$ in 1880. The revenue of the corporation from all sources increased from $\pounds 461,163$ twenty years ago to $\pounds 582,588$ ten years since, and $\pounds 725,668$ last year.

ago to 5052,588 ten years since, and 5729,008 last year. As evidence of returning trade prosperity in Switzerland, it is mentioned that the watch trade has lately become so active that manufacturers are raising their prices for watches in the rough by 80 per cent, and for finished watches 30 per cent. This movement has probably been hastened by the burning down at Beaucourt, in the French Jura, of one of the largest watchworks factories in Europe, whereby Swiss manufacturers have greatly benefitted.

THE river Bradford recently broke through the roof of a disused The river branched recently broke through the roof of a disaster mine at Alport, in Derbyshire, and nearly all its water there dis-appeared. The labours of a number of miners have been successful in filling up the large chasm. The stream, however, still flows through the mass of rock and timber thrown into the opening, and finds its way to the Derwent underground. It is impossible to divert the stream by reason of the conformation of the ground.

An important discovery of plumbago has, it is said, been made in New Zealand. A party prospecting on Government land in Canterbury, for coal, discovered a seam below the anthracite. The seam, which was 2in. at the outcrop, has increased, according to the *Colonies and India*, in thickness to nearly 4ft. The mine is only five miles from a railway station, and a metalled road to the workings is being formed. The analysis given by the assays rebows workings is being formed. The analysis given by the assayershows 89'5 per cent. of graphite.

89'5 per cent of graphite. A CONTRACT has just been agreed upon, says the New York Herald, between the authorities of Florida and J. C. Coryel, of Jacksonville, and A. B. Linderman, representing capitalists of Philadelphia and the Pacific coast, to drain Lake Okeechobee, in South Florida. If the scheme is carried out 12,000,000 acres of the best sugar land in the world will be reclaimed. The territory reclaimed will include the celebrated Everglades, and will be in extent twice as large as the State of New Jersey. This is the largest contract on record, and when completed Florida will be able to produce more sugar than the United States can consume.

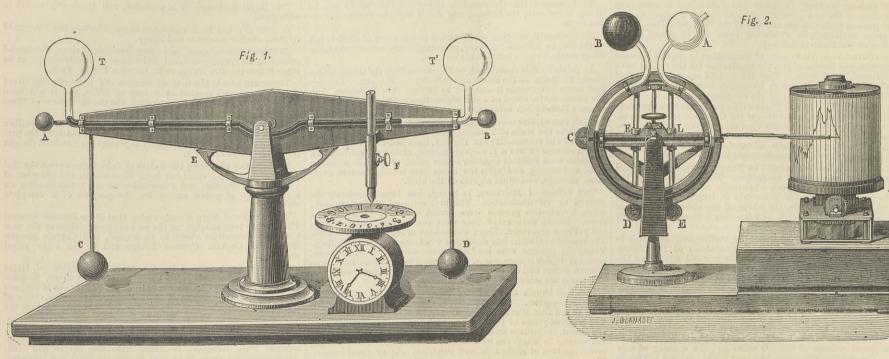
to produce more sugar than the United States can consume. THE arrangements for the English exhibitors at the Electrical Congress and Exhibition at Paris have, by some remarkable mis-fortune, fallen into the hands of South Kensington, and the Elec-trician asks what reason there can be for an elementary teaching department being allowed to take up the arrangements of an exhi-bition of electrical apparatus illustrative of progress in that science, progress of which such a department has no knowledge, and as little real sympathy. Recent South Kensington exhibitions have been such a farce, and irregularities connected with them so much talked of, that one would have thought that the assurance of even those concerned would have shrunk from the possibility of making another *fiasco* and from another exposure. The mean illuminating power of the cas sumplied by the three

making another *flasco* and from another exposure. THE mean illuminating power of the gas supplied by the three gas companies under the supervision of the Metropolitan Board of Works, excepting the Cannel gas supplied to Westminster, was during the week ending the 2nd inst. from 17'1 to 17'8 candles, the highest being in the Old Ford district of the Commercial Gas Company, and in the Dalston district of the Gas Light and Coke Company; and the lowest in the Chelsea district of the Gas Light and Coke Company, and Peekham district of the South Metro-politan Gas Company. The greatest mean quantity of sulphur was in the gas of the Gas Light and Coke Company supplied to Kingsland, each 100 cubic feet of the gas containing 17'9 grains. The same company's gas contained the largest mean quantity of ammonia, namely, 0'5 grain per 100 cubic feet at Bow. The weekly report to the Board by Mr. T. W. Keates, consulting chemist, also shows that sulphuretted hydrogen was again entirely absent and the pressure in excess. At the meeting of the Commissioners of Sewer of the City of

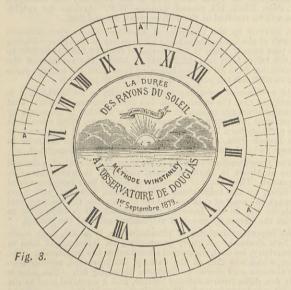
chemist, also shows that sulphuretted hydrogen was again entirely absent and the pressure in excess. Ar the meeting of the Commissioners of Sewer of the City of London on Tuesday afternoon, the Acting Remembrancer, Sir T. J. Nelson, reported upon the Bill of the Metropolitan Railway Company, for the extension of the line from Aldgate to Tower-hill, and he recommended that the opposition to this Bill by the Com-missioners of Sewers be withdrawn. He explained that originally there was an agreement between the Metropolitan District Railway and the Metropolitan Railway Company for the completion of the Inner Circle Railway, but owing to want of funds and other causes, nothing had been done, and the important work remained in com-plete abeyance ; but now the Metropolitan Railway, having funds at their disposal, proposed by the Bill now before Parliament to complete a portion of the line at their own cost, and, as he con-sidered none of the provisions of this Bill in any way affected the Corporation of London, he considered it was not necessary to con-tinue the opposition to the Bill.—Mr. Rudkin, after saying that their proceedings required watching, said he considered that the opposition to the Bill ought not to be absolutely withdrawn. If the Bill was carried in its present shape no steps would be taken to oppose the passing of the Bill; but if any objectionable altera-tions were to be made in it, they would then have an opportunity of opposing the measure.—Alderman W. Lawrence said that if there really was nothing objectionable in the Bill he could not understand the object of opposing it. The Inner Circle Railway completion was a most important and public object, and if only a small additional portion was completed by the Metropolitan Rail-way Company, it would be a great advantage to the public.—The proposition of Mr. Rudkin, that the opposition to the Bill should be continued, was, however, agreed to.

Coucher du Solei

WINSTANLEY'S RADIOGRAPH.



Lever du Soleil

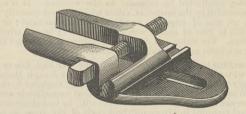


MR. D. WINSTANLEY, F.R.A.S, of Richmond, has for some time past sought to improve on existing instruments for measuring the duration of sunshine, and he has now produced the apparatus the duration of sunshine, and he has now produced the apparatus illustrated by the accompanying engravings. It has been tested in the Isle of Man with, we understand, great success. Its con-struction is very simple, and will be readily understood. Fig. 1 is the apparatus for measuring the duration of the sunshine. Fig. 2 shows the radiograph, an instrument which records both the duration and the intensity of sunshine. Fig. 3 is a facsimile of the record made by the instrument shown in Fig. 1, while Fig. 4 is a facsimile of the record made by the radiograph. In Fig. 1 a delicate balance carries two bulbs T T. The left bulb T is alone exposed to the possible radiation of the sun. The balls A and B are fitted on screws, and are for the adjustment of the balance of the beam. The adjustment is so made that in the Is alone exposed to the possible radiation of the sun. The balls A and B are fitted on screws, and are for the adjustment of the balance of the beam. The adjustment is so made that in the absence of sunshine the beam rests gently on the support at E. When the sun comes on to shine the air in the left-hand bulb becomes dilated and forces the mercury to the right hand of the tube, thereby bringing a considerable portion of its weight to bear upon the pencil point, which draws a line upon the paper disc supported on a brass disc driven by a clock. When the sun ceases to shine the opposite of this takes place, the air cools, the mercury returns, the beam assumes its original equilibrium, the pencil point is raised, and the production of the trace stops. The radiograph consists substantially of two bulbs of glass A B connected by a tube which is circularly curved and mounted concentrically upon a wheel of brass which turns through its geometric centre on a knife edge of hardened steel resting on agate planes. Half the bend in the connecting tube is filled with mercury. Both bulbs are closed, and one is painted black. The temperature of the air obviously has no influence on an arrage-ment of the kind, for its effects are experienced in both bulbs the same, nor is it influenced by the barometric variations of the outer air. But under the influence of radiant heat the air con-tained in the blackened bulb expands, compressing that within its of the sume. outer air. But under the influence of radiant heat the air con-tained in the blackened bulb expands, compressing that within its fellow, and by pressure on the mercurial column which the tube contains, swings the wheel into an angular position of equilibrium, which varies with the intensity of the radiance to which it is exposed. Accordingly, in so far as now described, the apparatus is a "radiometer" in the proper meaning of the term, *i.e.*, a measurer of the thermal radiance to which it is exposed. A needle, prolonged from one of the radii of the wheel, is brought in gentle contact with a metallic cylinder driven by clockwork at an even speed, and the radiograph is complete. A piece of an even speed, and the radiograph is complete. A piece of an even speed, and the radiograph is complete. A piece of glazed paper is wrapped around the cylinder already named, the ends are secured, and the surface carefully and evenly smoked quite black. The needle of the radiograph rests gently on the surface of a cylinder covered in this way. Every passing cloud which floats before the sun makes the needle rise and fall, and at each rise and fall it leaves a clear thin line. The brighter the sun the higher will be the line, the heavier the cloud the lower it falls, whilst the constant rotation of the cylinder lower it falls, whilst the constant rotation of the cylinder separates the effect of the different clouds, and produces a diagram on which we see at a glance the variations in the solar radiance for every moment of the day. These diagrams are fixed by immersion in a bath of weak lac varnish. When this is dry the black previously so easily removed is proof against friction, and as firmly fixed upon the paper as is the ink with which we print. The "radiograms," as Mr. Winstanley calls which we print. The "radiograms," as Mr. Winstanley calls these diagrams of solar radiance, are very curious things, and have already shown some facts of which we should imagine few people have even dreamed. The radiance of the sun is almost always shown, for minutes at any rate, and often enough for hours

before his time to rise, and, very singularly, the maximum of nocturnal radiance is attained at the noon of night. As the sun approaches the meridian of our antipodes the needle of the radiograph rises slightly from the datum line, and like a sleeper who goes over again in dreams the proceedings of the day, it writes down feebly "there is solar radiance" at a time when above all others one would fancy there was none. But for the writes down feebly "there is solar radiance" at a time when above all others one would fancy there was none. But for the frequency of its occurrence, and the very even distribution of curve at the anti-meridian passage of the sun, one would be inclined to attribute the observed effect to the radiation from the earth. In several of the radiograms the passage before the sun of several hundred clouds is shown in a single day, and in some instances as many as three in a single minute's time. The radiograph when used is enclosed in a box of copper, the bubbs projecting upwards into a dome of glass. The whole has hitherto been fixed on a wooden stand, the legs of which are firmly imbedded in the ground. In this condition, according to the *Manx Sun*, it weathered out, on the lawn of Government House, Isle of Man, the heavy gales which blew between the 17th and 24th of April last.

7 Navantire 18:79

A PROHIBITED DOG-A DOG IN THE MANGER. It is an unfortunate thing for some of those whose recent writings have referred to the American patent laws as of a most beneficent character and worthy of English imitation, that Americans are themselves beginning to get very tired of laws which are so very different in their practical operation from what the ordinary inventor who only knows of general rules



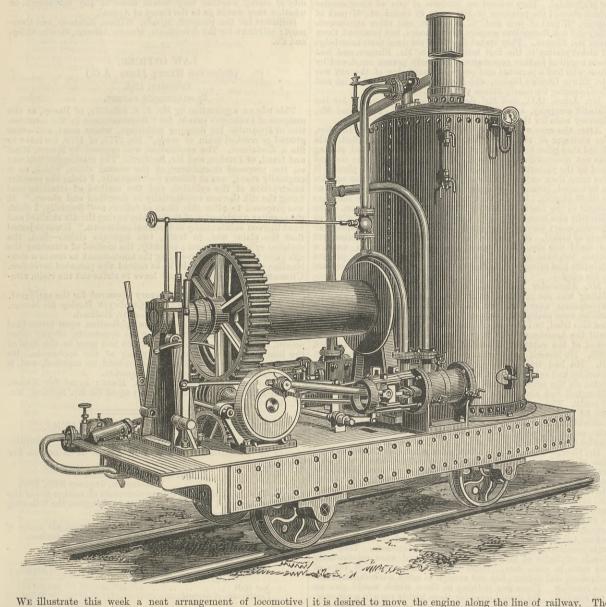
"The U.S. patent laws are intended to protect inventors, and to enable them to reap substantial benefit, while permitting their inventions to be applied to the uses for which they were brought forth. Perhaps, in most cases, these laws accomplish their object. We have before us, however, a case of 'dog in the manger,' sus-tained by the patent laws. One of our correspondents writes :-'I saw in your issue of Feb. 5th a letter from A Dolbeer, in which he describes with a cut a lathe dog designed by him. I send enclosed a cut of one which I got up in August 1878. I had never seen or heard of such a thing before, I applied for a patent, got out cuts, a quantity of castings, &c., and was about ready to place it on the market, when I found my claims con-flicted with several patents already issued for a dog with movable jaws. That stopped it, there and then. The parties holding the patents have never placed a dog on the market, and will enter into no arrangement to have it done without a high royalty being paid. There is a real demand for such an article, but there the matter rests. The dogs cannot be made without infringing upon somebody's patent."

Fig. 4.

<text> circulating tubes or other methods of strengthening them.

COKE-DRAWING ENGINE.

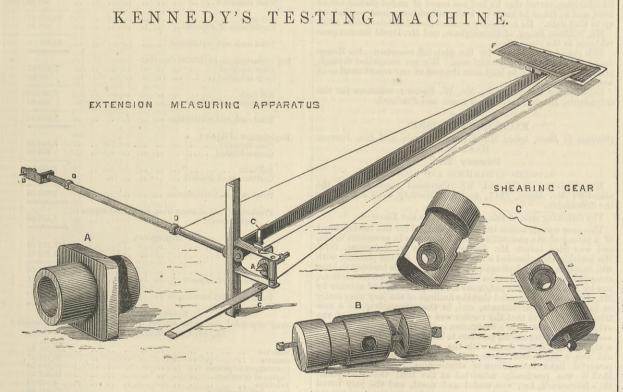
MESSRS. ALEXANDER CHAPLIN AND CO., CRANSTON HILL ENGINE WORKS, GLASGOW, ENGINEERS.



hauling engine, for drawing coke from the furnaces, two of which were made by Messrs. Alexander Chaplin and Co., of Glasgow and London, for the Blaenavon Company, Limited. The engines, from a photograph of one of which our illustration is taken, are of 6-horse power nominal, each having a pair of cylinders, placed horizontally on the wrought iron frame of the carriage, and geared to the hauling barrel by a worm and worm wheel ; a clutch on the worm wheel disengages the barrel, when

The handles for working the engine, feed pump, &c., are all disposed so as to be conveniently worked from the driver's platform. The various details are clearly shown in our illustration. The engine is of course available for other crane work.

A smaller engine of the same general construction was made by Messrs. Chaplin some years ago for this company, and it is in consequence of its successful working that the company has now had these more powerful engines constructed.



WITHIN the last few days a new wing has been opened in niversity College, Gower-street, and we regard the event as most prominent feature is the testing machine. This is worked by WITHIN the last few days a new wing has been opened in University College, Gower-street, and we regard the event as opportune for saying a few words regarding the excellent work being done by Mr. Kennedy, Professor of Engineering at the college. Most of our London readers, at all events, are familiar with the external appearance of the college, which was begun in 1828. From time to time more space has been wanted, and the new wing has been opened none too soon. It contains art studios, a museum, and two fine laboratories. Space has been utilised to the utmost, a physiological lecture theatre, of good proportions, being constructed in the roof and invisible from the ground. The wing was designed by Professor T. Hayter Lewis, and was built by Mr. W. Brass, under the direction of Messrs. Perry and Reed, and includes within its walls a lecture room for 170 students, and a microscope room for 100, in the physio-logical department. The construction of this wing gave Pro-fessor Kennedy more room. His laboratory is on the ground floor, or rather partly below it, in another part of

manual power at present, and closely resembles Mr. Kirkaldy's machine in some of its features. It can exert a maximum strain of 100,000 lb., and can either stretch, compress, or bend a specimen to be tested. The machine was constructed by Messrs. Greenwood and Batley, Leeds. The strain is applied by hydraulic pressure and the amount of the strain is measured by hydraulic pressure, and the amount of the strain is measured by a dead weight acting through a system of levers. The maximum leverage is 100 to 1, and the maximum weight is 1000 lb., 50 lb. of which are represented by the truck supporting the weight and running on the steel yard. Immediately over the machine is placed the optical arrangement for measuring very small exten-sions, devised by Mr. Willis, and already described and illustrated

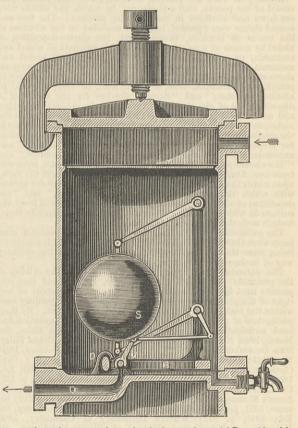
sists of a very light frame D, stiffened by silk lines, and carrying a simple lever E. This frame is secured by two light set screws, A B, to the specimen to be tested, an accurately-measured interval of, say Sin., intervening between the points of the set screws. A light weight balances the gravity of the frame. The lever turns on the points of two screws C C. To the end of the lever is secured a vernier made of paper, and this vernier rests on a strip of "section paper," the lines on which work with the vernier. When the specimen is extended, the two clamping screws are of course separated, and their motion is communicated to the lever, and in this way extensions of $\tau_0 \bar{\sigma}_0 \tau_0 \tau_0$ is made by it to appear as elastic as a gas when under a strain of about 2 tons. If the counterpoise weight on the long lever of the steel-yard be set swinging by hand like a pendulum, the hand of the extension measurer may be seen to a pendulum, the hand of the extension measurer may be seen to move backwards and forwards with each oscillation of the weight. The gear for shearing strains is also shown in our cut. It consists of two half cylinders, B C, which can slide on each other in the socket A. At B they are shown together, at C apart. The bar to be sheared is put into the holes shown, and B and C are then drawn apart, shearing the specimen in sliding over each other. The specimen cannot exceed in length the internal diameter of A. There is also in the laboratory an excellent machine for measuring the resistance of bars to torsion, and another designed by Dr. Lodge for illustrating certain electrical phenomena. The room is provided with lathes and drills, benches and vices, and students can here learn a great deal of the handicraftwork of the mechanical engineer, besides much else.

engineer, besides much else. Motion is given to the various machines at present by one of Davey's ingenious motors—shown at the end of the engraving. This is really a steam engine. Instead of a boiler proper it has a coil of wrought iron pipe placed in a kind of vertical furnace, and into the pipe a measured quantity of water and a little air are injected at each stroke of the engine. Hitherto a difficulty has been experienced with the apparatus, the coils burning out, but we understand that this has now been overcome, and we shall probably have more to say on the subject. Professor shall probably have more to say on the subject. Professor Kennedy hopes, however, to have in a short time a steam engine, with which he proposes to carry outa series of experiments which cannot fail to prove very valuable. He will test the engine under all possible conditions of pressure and expansion. It would be difficult to overrate the value of such a laboratory

as this, and of the instruction given by Professor Kennedy to the rising generation of engineers, and although no college course can act as a substitute for practical training, yet at University College the student can have seed sown in his mind which, nurtured and grown under the influence of practical experience subsequently, can hardly fail to produce a good crop.

AUTOMATIC GOVERNOR FOR WASTE WATER PIPES.

THE accompanying illustration which we take from the Deutsche Gewerbe Zeitung shows a governor described as being em-ployed to control the flow of the waste water from a surface con-denser. The valve V, which closes the inner end of the outlet C, is mounted in a frame R, which has its fulcrum at D, and



presses the valve upon the end of the outlet with considerable pressure, insuring a close joint not affected by the accumulation of sediment. The valve is worked by a series of levers actuated by a float S, which rises and falls with the water, and thus opens and closes the valve V.

THE YORKSHIRE BOILER INSURANCE AND STEAM USERS' COM-

THE YORKSHIRE BOILER INSURANCE AND STEAM USERS' COM-PANY.—We learn from the report of the chief engineer, Mr. John Waugh, read at the annual meeting, February 7th, 1881, that during the year just passed 98 per cent. of the boilers entrusted to the company's oversight have been thoroughly examined, a result which is highly satisfactory when the difficulty of obtaining appointments for "thorough" inspections is considered. No fewer than 1223 defects have been detected by the inspectors of this com-pany, of which 77 were dangerous, including 20 cases of corrosion and 11 of grooving. —THE SOCIETY OF CIVIL ENGINEERS OF PARIS AND FRENCH PORTS. —The tonnage of the following ports during the year 1879 was given in a paper read before the Paris Société des Ingenieurs Civils, by M. Hersent :—Of Antwerp it was 5,614,243 tons ; Dunkerque, 726,401 tons ; Le Havre, 1,888,099 tons ; Rouen, 582,951 tons ; Bordeaux, 871,930 tons ; Marseilles, 2,591,052 tons ; Gênes, 2,068,973 tons. He also called special attention to the value of the docks projected under M. Freycinet at the port of Dunkerque. M. A. Pyotte-Beyaert, of that port, worked hard many years in the endeavour to get the necessary dock and harbour improvements carried out to give back to Dunkerque the important position it once held among the ports of France. As long ago as 1868 he caused fully matured plans and estimates to be lithographed and largely circulated in the endeavour to improve the port.

LEGAL INTELLIGENCE.

HIGH COURT OF JUSTICE-CHANCERY DIVISION. (Before VICE-CHANCELLOR BACON.)

February 9th to 11th, 14th to 18th.

(lefore VICE-CHANCELOB EACOL) February 8th to 11th, 14th to 18th. THE DATING COMPANY, LIMITED, F. FARQUHARSON. THIS action was brought by the plaintiff company against Mr. Aff. Hy. Dashwood, trading as the Nickel Plating Company, to plaintiff company, and granted to William Brookes in respect of an invention—a communication from Isaac Adams, jun., of Boston, U.S., dated the 28th October, 1869, No. 3125. This invention, according to the specification, relates to the preparation of the invention of nickel plates for anodes of the depositing cells. It is pointed out in the specification that the solutions from which theretofore nickel had, prior to the invention, been most success-fully deposited are the chloride of nickel and ammonia, and the double chloride of nickel. And ammoniny, of these the inventor bitars and the double sulphate of nickel and ammonia, and the double chloride to be the best, but the depositie of nickel and potassium, the double sulphate of nickel and ammonia, and the double chloride of nickel. The double eyanide of nickel and potassium is a poor conductor, and requires a high battery power. Of the other two the inventor believes that the best prover. Of the other two the manner described by him, the pure metal deposited to any appreciable thickness. Hi is spit to be coloured by peroxide, and liable to split up prover the solution. This is to be made of pure nickel, or the pure metal is to be disolved in a mixture of one part of water and shiftle excess of adja possible ought to be used. To the resulting solution a quantity of sulphate, add hesolution the pure metal is to be disolved in the without the described by him, the pure metal is to be disolved in the without the double sulphate, and as little excess of adja possible ought to be used. To the free sulphurie acid, six parts of hydrochloric acid, and one part of water, and shiftle excess of adja possible ought to be used. To the free sulphurie acid, the means again gradually heated to a similar promotina THE PLATING COMPANY, LIMITED, v. FARQUHARSON.

 Solution. The spectreation then points out that the use of a battery of too high an intensity is to be avoided; that great pre-caution should be used to prevent the introduction of potsah, soda, or nitric acid; that the anode of the depositing cell should present a larger surface than the surface to be coated, and that if zinc is to be coated, it should first be coated with copper.
 In the year 1873 the plaintiff company, who had become possessed of the patent, filed a disclamer, by which the claims were out down and modified in the following manner:—The first and second claims were retained, but were modified by the addition of the words in brackets, thus—"First, the electro-deposition of inckel by means of a solution of the double chloride of nickel and ammonia, prepared (as above described) and used (for the purposes above set forth) in such manner as to be free from the presence of potsah, soda, alumina, lime, or nitrie acid, or from any acid or alkaline reaction;" and "Second, the use for the anode of a depositing cell of nickel combined with iron to prevent the copper nickel, or from injuring the solution." The remaining three claims in the original specification relating to "the methods herein described for preparing the solution of the double sulphate of nickel and armonia, and the double chloride of nickel and armonia, and the double chloride to nickel and armonia, and the double chloride to nickel and armonia, and the double chloride of nickel and armonia, which the article may be brought in contact," and "the deposition of electrocype plates of nickel and used separately thereform," were struck out and abandoned.
 The defendants, by their defence, put in issue the validity of the plaintiff' company were that the defendants had at their works in freek-street, soho, since the 1st January, 1879, plated goods.
 The defendants, by their defence, put in issue the validity of the plaintiff' maten and and the disclaimer, and were speced. Site, not 2724; W. R. Mam; W. Parkes, Timothy Morris, and Piercehouse, Johnson, and Morris, all of Birmingham.

Morris, all of Birmingham. In the month of March last year an application was made to the Master of the Rolls, in whose Court the action was then pending, for leave to inspect the defendants' works, and the application being opposed by the defendants on the ground that the process used by them involved certain trade secrets, the judge appointed Professor Dewar as analyst with power to examine the defendants' process, and to report to the Court upon the facts, and his opinion founded on them; but Professor Dewar was not to disclose his report on the facts, or his opinion, without leave of the Court. The defendants were then interrogated at considerable length by the plaintiff company, and in their answer they stated, amongst other things, that they used a solution of double sulphate of nickel and ammonia. They did not themselves manufacture the salts used by them—which they believed were made according to the method published by Brande, not themselves manufacture the saits used by them—which they believed were made according to the method published by Brande, and which they obtained from Mr. W. Elmore, of 91, Blackfriars-road. These salts they dissolved in water, and having fixed a nickel anode to the positive pole of the rods in the bath, and the cathodes on the negative pole, the process was completed by the help of a dynamo-electric machine. They further swore that they took no special precautions, but they made an addition to their

THE ENGINEEK. process, which they claimed to be their trade secret. They took no precautions to prevent the introduction into the bath of potash, soda, alumina, lime or nitric acid, nor to provide that their solution should be neutral; on the contrary it was strongly alkaline, and they denied the possibility of using an ammonium solution that was not alkaline. They further denied that the use of anodes of pure nickel was new, or that the presence of copper or arsenic would be prejudicial. They set out an analysis of one of their anodes which showed the presence in 100 parts of nickel of '47 part of copper, '97 part of iron and '67 of carbon and other substances. They did not themselves prepare their anodes, but procured them from Mr. Elmore. They stated that they obtained their knowledge of nickel plating in the first instance from Mr. Elmore, and had since acquired further experience. The only person employed by them who had a personal and practical knowledge of the art was Mr. Edwin Charles Blaker, who had been a practical chemist and electro-plater for nearly fifteen years. Mr. Aston, Q.C., and Mr. Seward Brice were counsel for the plaintiff company, and Sir Henry Jackson, Q.C., M.P., and Mr. Macrory were for the defendants. After the case was opened by Mr. Aston, Mr. Henry Brookes, the manager of the plaintiff company's works, was called. He stated that prior to the date of Adams's invention nickel plating was not commercially practised. He then described the arthods used by the plaintiffs. He pointed out that in nickel plating it was more than ordinarily necessary to clean perfectly the articles to be coated, because a defective coating could not be repaired as in silver plating. He said that the nickel anodes could be and were bought in the market. Josiah Mason and Co. made them. The plaintiffs also bought the salts used by them from Mr. Carlyle, of Birmingham ; formerly they made them. They were double sul-phate of nickel to his knowledge, and the present plaintiffs had

phate of model. The network of apple of minimum the mathematical pro-he could not say. Mr. Unwin, of Sheffield, had also made a double sulphate of nickel to his knowledge, and the present julantifis had brought an action against him when the witness was in his employ. Mr. Alexander Parkes also stated that prior to 1869 nickel plating was not practised as an art. At Messrs, Mason's works experiments were made by Mr. Thomas Farn, and some small articles were coated, but only as playthings. The witness himself had also tried, but the use of nickel as a coating did not come in until the American forced it upon manufacturers. He had never heard of the solutions described in Brookes's specification before 1860. He himself had tried so many he could not remember them all. He had tried double cyanides, acctates and phosphates, chlorides and sulphates, but he could not get any large amount of nickel on the articles. The solutions were used warm. Messrs. Elkington had also coated some small articles, but not in the way of trade. The solutions used were mostly ammoniacal mixtures, but he could not say how they were prepared. The anodes were makeshift affairs, usually granulated nickel confined in a platinum wire net or lumps of nickel. The witness had cast some small anodes for Mr. Farn. Dr. George Gore, F.R.S., after being referred to the specifica-tion of Brookes's patent, said that he had not heard of such a process being in existence prior to 1869, or any such method of using pure double sulphate and pure double chloride of nickel. He confirmed the opening statement that the presence of potash and other soluble altakies would be injurious, as causing a precipi-tation of hydrated oxide of nickel to the injury of the deposit. It was desirable that the solution should not have an alkaline re-action. He had not known of the use of a pure nickel anode before Adams announced it. He had analysed three samples of salts procured from Mr. Elmore and the defendants. They were double sulphates of nickel and ammonia, and were

Solicitor for the plaintiffs, Mr. W. Foster; solicitors for the defendants, Messrs. Chapman, Turner, and Prichard.

EXCHEQUER DIVISION. (Sittings in Banc, before MR. BARON POLLOCK and MR. JUSTICE HAWKINS.)

February 23rd.

HAYWARD v. HAMILTON AND ANOTHER. Mr. Webster, Q.C., and Mr. Carpmael appeared for the plaintiff; Mr. Aston, Q.C., and Mr. Macrory were counsel for the defendants.

The following note of this case appears in the Times :

The following note of this case appears in the *Times* — This case was an action to recover damages for the infringement of a patent of the plaintiff's for improvements in pavement lights, and was tried before Mr. Justice Hawkins in November, 1879. His lordship then directed a nominal verdict for the plaintiff with 40s. damages on the findings of the jury; but his lordship did not enter judgment for either side. There were to-day two cross-motions, one by Mr. Webster for judgment for the plaintiff, and another by Mr. Aston, who contended that the findings of the jury were really in favour of the defendants, and, in the alternative, for a new trial on the ground that the verdict was against the weight of the evidence. The plaintiff's contention is that his invention is novel and useful, no one having previous to his patent of 1871 constructed In favour of the defendants, and, in the alternative, for a new trial on the ground that the verdict was against the weight of the evidence. The plaintiff's contention is that his invention is novel and useful, no one having previous to his patent of 1871 constructed a strong iron frame flush with the pavement and utilised the old ship's light with glass prisms so adjusted as to let in a powerful light into cellars or store-rooms. His counsel urged that it was practically admitted at the trial that the plain-tiff's framework, &c., was useful and novel, and the jury found that it was new to glaze pavement lights in the manner set out in the plaintiff's specification, and that the defendants' frame-work and prisms were a colourable imitation of it. The defendants rely on the answer given to one of the questions put to the jury—viz., whether, having regard to the state of knowledge at the date of the patent, it was a new thing to form and arrange a prism so that the light would be thrown forward in one direc-tion by making one of the sides of the prism upright, or nearly so, and the other side inclined to it at such an angle that the light passing through the upper surface may strike the inclined side and be reflected completely, or nearly so, within the prism, and issue from the upright, or nearly upright, side in the direction required : "Is that a new thing, having regard to the state of knowledge in 1871, the date of the patent?" Answer,—"No." The plaintiff's invention, therefore, it was contended, was not novel, and it could not be the subject of a patent. Something very similar had been done by a Mr. Darker, by means of a prism, before the patent of the plaintiff. The form of the frame was old and the glass flange was old, and the defendants, by cutting a nick out of a glass flange was old, and the defendants, by cutting a nick out of a

glass prism placed in a frame, had only used the knowledge common glass prism placed in a frame, had only used the knowledge common to all the world, and had not infringed the plaintiff's patent. After hearing the arguments of counsel and a full citation of the authorities, their Lordships gave judgment for the plaintiff with costs, granting also the injunction and account prayed for in the claim. The matter was, however, directed to stand over for ten days, in order that the defendants' advisers might have an opportu-nity of seeing whether they would come to any settlement, or whether they would go to the Court of Appeal. Solicitors for the plaintiff, Messrs. Wilson, Bristows, and Carp-mael ; solicitors for the defendants, Messrs. Ashurst, Morris, Crisp, and Co.

LAW OFFICER. (Before SIR HENRY JAMES, A.G.)

February, 12th. Re CRABTREE'S PATENT.

Re CRABTREE'S PATENT. This was an application by Mr. J. S. Sutcliffe, of Bacup, as the assignee of Crabtree's patent for "Improvements in the construc-tion of apparatus for dressing middlings, wheat meal, and other ground or crushed grain or seeds," No. 2775, of 1878, for leave to file a disclaimer. The application was opposed by Messrs. Hind and Lund, of Preston, and Mr. Bedford. The chief opposition was on the proposed amendment of the second claim, which, as it originally stood, was as follows :— "Secondly, I claim the peculiar construction of the cylinder, and the method of straining and fixing the silk thereon substantially as described and shown." It was proposed to alter this claim as follows :— "Secondly, I claim the peculiar construction of the cylinder having the silk strained and fixed thereon substantially as described and shown." It was objected that the claim was, in truth, two separate claims—first, the skeleton cylinder or frame ; secondly, the method of attaching the silk ; and that it was proposed by the amendment to create a com-bination claim, which would be to extend the patented invention. Ultimately, the applicant asked leave to strike out the claim alto-gether.

Ultimately, the applicant asked leave to strike out the database gether, Mr. Aston, Q.C., and Mr. Macrory appeared for the applicant, Mr. Gorst, Q.C., M.P., and Mr. Chadwyck Healey for Messrs. Hind and Lund, and Mr. Goodeve for Mr. Bedford. The Attorney-General allowed the application upon terms that no action should be brought against the opponents, or any other person, in respect of any machine which had prior to the date of the hearing been made or sold by any of the opponents. He directed that lists of such machines should be supplied, and, if required, be verified by statutory declaration. Solicitor for the applicant, Mr. B. Hunt; agent for Messrs. Hind and Lund, Mr. W. Lloyd Wise; agent for Mr. Bedford, Mr. W. Barlow.

PATENTS IN THE UNITED STATES.

THE following is the annual report of the Commis-sioner of Patents for the United States of America for the year 1879 :--

United States Patent-office, Washington, January 30th, 1880. SIR,—In compliance with the requirements of section 494 of the Revised Statutes, I respectfully submit to Congress the following report for the year ending December 31st, 1879 :—

Detailed statement of all moneys received for patents, for copies of records or drawings, or from any other source whatsoever. RECEIPTS. Amplication

Applications : Cash received Cash refunded							dols. 565,630 00 1,680 00
Net cash		::				.:	563,950 00 59,653 00
Total cash and certificates	3	•••					623,603 00
Copies : Cash received Cash refunded	::			::	···		48,328 58 1,541 70
Net cash		··· ···					46,786 88 1,029 66
Total cash and certificates				•••			47,816 54
Recording assignments: Cash received Cash refunded			•••		· · ·		$20,622\ 05$. 569 60
Net cash						··· ··	20,052 45 345 25
Total cash and certificates							20,397 70
For subscriptions to Official C Cash received Cash refunded	lazet	tte:					7,473 87 61 04
Net cash		··· ···					7,412 33 266 00
Total cash and certificates	s						7,678 33
Registration of labels : Cash received Cash refunded	.:		···	::			$3,240\ 00\ 900\ 00$
Net cash	::			::	.:	::	$2,340\ 00\ 216\ 00$
Total cash and certificates					• •		2,556 00
Proceeds of sale of scrap in Cash received				nd c	oppe	er:	1,879 90
Ag_l Cash receivedCash refunded	greg	ates.					$647,173 \ 90 \\ 4,752 \ 34$
Net cash	E						642,421 56 61,509 91
Total cash and certificates							703,931 47
EXPE							

Amount expended under the several appropriations, from January 1st, 1879, to January 1st, 1880.

100, 1010, 00 0 0000001 9 1	130, 1000.		
Salaries	: .: .:		dols. 398,761 04 29,761 87 39,919 50 18,357 53
Photo-lithographing		•••	4,599 60 37,041 68
Scientific Library	• •• ••		1,197 75
Total			529,638 97
RECEIPTS OVER EXPENS	DITURES		
Total receipts		•••	703,931 47 529,638 97
Receipts over expenditures			174,292 50
Statement of balance in the Treasury behalf of the Patent .	of the U Fund.	nite	
			dols.

Balance January 1st, 1880 1,420,806 56

Summary of the business of the Office.	
pplications for patent, including designs	20,05
pplications for re-issue	 63
pplications for registration of trade marks	
pplications for registration of labels	 57
aveats filed	 2,62 12,72
atents issued, including designs atents re-issued	 48
atents extended	 None
atents expired during the year, exclusive of designs	
atents withheld for non-payment of final fee	1,31
rade marks registered	87

Labels registered Number of patents issued to the several States and Territories, with the ratio of population to each patent granted; also the number of patents issued to subjects or citizens of foreign Governments.

E	states :	and ter	rito	ries.				Patents and designs.	One to every—
Alabama								61	16,344
Arizona Te	erritor	у							-
Arkansas								28	17,303
California								353	1,649
Colorado								29	1,626
Connecticu								569	945
Dakota Te								9	4,500
Delaware								24	5,209
District of								122	1,808
Florida								9	20,916
Georgia								74	16,002
Idaho Teri								3	6,861
Illinois								949	2,676
Indiana				11				359	4,681
and the second se								309	
				•••	•••		• •	81	3,865
Kansas			••	••	••	•••	•••		4,609
Kentucky			• •		••	••		156	8,468
Louisiana			•••		• •		••	59	12,321
Maine			•••	••	••	• •		112	5,598
Maryland			••	• •	• •	••	• • •	220	3,550
Massachus					• •	•••		1,134	403
Michigan						••		391	3,037
Minnesota								101	4,416
Mississipp	i							45	18,398
Missouri								283	6,082
Montana '	Cerrito	ry						4	9,974
Nebraska								48	2,715
Nevada								29	2,025
New Ham	pshire							95	3,351
New Jerse	y							587	1,544
New Mexi	co Te	rritory						2	55,652
New York								2,556	1,717
North Car	olina							55	19,480
								902	2,955
Oregon								19	5,363
Pennsylva								1,369	2,578
Rhode Isl	and							191	1,138
South Car	olina							36	19,600
Tennessee								91	13,830
Texas								142	5,767
Utah Terr	itom				•••		•••	142	14,226
Vermont	roory						••	70	4,722
Virginia						•••			
Washingto	m Tim	itom			•••	••		107	11,450
West Virg					•••	•••	•••		5,847
						••	••	49	9,021
Wisconsin	Tomate	** **			•••			215	4,958
Wyoming	rerrit	ory	••	• •	•••	• •	••	5	2,304
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Of the patents, including designs, there were granted to the-

12,725 Comparative statement of the business of the Office from 1837 to 1879. inclusive.

Year Applica- Caveats Patents filed. issued. Cash Cash Surplus. expended. received. dols. 33,506 37,402 34,543 39,020 52,666 31,241 30,776 36,244 80,805 dols dols. dols. 28,289 08 42,123 54 37,260 00 38,056 51 40,413 01 36,505 68 35,315 81 42,509 26 51,076 14 50,264 16 63,111 19 67,576 69 98 $\begin{array}{c} 1838\\ 1839\\ 1840\\ 1841\\ 1842\\ 1843\\ 1844\\ 1845\\ 1846\\ 1847\\ 1848\\ 1849\\ 1850\\ 1851\\ 1852\\ 1853\\ 1855\\ 1855\\ 1855\\ 1855\\ 1856\\ 1857\\ 1858\\ 1859\\ 1850\\ 1864\\ 1862\\ 1864\\ 1864\\ 1864\\ 1864\\ 1865\\ 1864\\ 1864\\ 1865\\ 1864\\ 1864\\ 1865\\ 1864\\ 1864\\ 1865\\ 1864\\ 1864\\ 1865\\ 1864\\ 1864\\ 1865\\ 1864\\ 1864\\ 1865\\ 1864\\ 1864\\ 1865\\ 1864\\$ 520 425 473 517 531 502 502 619 5724,721 44 2,716 49 $\begin{array}{c} 10 \\ 51 \\ 67 \\ 87 \\ 48 \\ 96 \\ 73 \end{array}$ 228 312 391 315 990 5,264 20 4,538 85 6,264 53 11,680 49 $\begin{array}{r} 380\\ 452\\ 448\\ 553\\ 607\\ 595\\ 602\\ 760\\ 996 \end{array}$ $65 \\ 71$ 46,15841,878 $\begin{array}{c} 63,111 \ 19\\ 67,576 \ 69\\ 80,752 \ 98\\ 86,927 \ 05\\ 95,738 \ 61\\ 112,656 \ 34\\ 121,527 \ 45\\ 192,588 \ 02\\ 196,132 \ 01\\ 203,716 \ 16\\ 192,588 \ 02\\ 196,132 \ 01\\ 256,352 \ 59\\ 137,354 \ 44\\ 215,754 \ 99\\ 195,598 \ 29\\ 240,919 \ 98\end{array}$ 660 1,070 2,193 869 1,020 958 901 2,678 1,902 2,024 2,502 2,910 3,710 868 906 4,4354,9604,7715,36436,919 02 1,024 $\begin{array}{rrrr} 10,522&42\\ 35,663&74\\ 3,531&79\end{array}$ 4,5384,8193,3403,5214,1705,0206,6167,6534,6435,0386,014824 $1,063 \\ 1,937$ 10,664 9,450 13,015 13,378 13,986 15,321 13,033 13,590 12,864 13,599 16,288 17,026 13,61920,420

19,47218,24620,41421,60221,63821,42520,30890,2603,3663,0903,2483,1813,0942,6972,8099,755699,726 703,191 738,278 743,453 757,987 732,34220,260 20,059 1878 1879 2,7552,620703,931 47 174,292 50 The Commissioners designated by law to superintend the recon-struction of the Patent-office building will soon submit their report, which will present a most satisfactory exhibit of the pro-

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1870

struction of the Patent-office building will soon submit their report, which will present a most satisfactory exhibit of the pro-gress of the work up to the close of the last calendar year. Appeals from the Commissioner of Patents to the Supreme Court of the District of Columbia, while authorised in *ex parte* cases, are by section 4911 interdicted in interference cases—the very class in which the right of appeal would seem to be most important. I recommend that section 4911 be so modified as to provide for appeals from the Commissioner of Patents to the Supreme Court of the District of Columbia in interference cases. As the law now stands (Rev. Stats., sec. 4898), an assignment of letters patent may remain unrecorded for any period of less than three months, and yet prevail over a subsequent assignment first subsequent purchasers, without notice and for valuable considera-tion, may be unable to find in the records of the Patent-office any evidence of the existence of the assignment. The records of the Office, therefore, cannot be relied upon to disclose the condition of the title to letters patent. As between *bond fide* purchasers for valuable consideration without notice, the priority of assignments should, I think, be determined by the dates of registration ; and I result. The duties to be performed by the Assistant-Commissioner while

the Commissioner is in charge of the Bureau are not prescribed by law. In practice the Commissioner assigns to him from time to time various duties, including the adjudication of appeals where no objection is made by any party thereto. A statutory provision, expressly authorising the Assistant-Commissioner to perform such of the duties imposed by law on the Commissioner as the Commis-sioner may from time to time assign to him, would relieve the Patent-office from the embarrassment resulting from existing uncertainty respecting the powers and duties of the Assistant-Commissioner. Commissioner.

Commissioner. It is provided in section 4887 of the Revised Statutes that— "Every patent granted for an invention which has been pre-viously patented in a foreign country shall be so limited as to expire at the same time with the foreign patent; or if there be more than one, at the same time with the one having the shortest term, and in no case shall it be in force more than seventeen veers."

viously jakented in a forsign country shall be so limited as to expire at the same time with the foreign patents or if there be more than one, at the same time with the one having the shortest term, and in no case shall it be in force more than seventeen years." The effect of this statutory provision is that if a citizen of the United States obtains no foreign patents for his invention, but bestows its benefits without restriction upon every nation except his own, he is rewarded by a patent in the United States for seventeen years. If, on the other hand, he restricts the use of his invention in foreign quart fixed much any be only a single year. And if he postpone his American application in order to secure a foreign patent, he may find himself involved in an interference in the fatent-office of the United States which will consume a large portion of the term of his foreign patent should be applied to the term of his foreign patent, should be applied to a term of the interfere of the domeine patent. Foreign letters patent which, if allowed the day before his American patent is no obstale to the issue of foreign patents without at all limiting the seventen years' duration of his American patent. Foreign letters patent which, if allowed the day before his American grant, might reduce the term of his patent from seventeen years. The records of the Patent-office to not enable the public to asser-tis whether patents have been adjudged wholly or in part invalid by the ourst. This is a serious defect in our system, which ought to be remedied by legislation providing for the transmission to the Patent-office of certified copies of all judgments and decrees of United States courts affecting the validity of patents, and for recording, digesting, and indexing the same in the Patent-office in such a way as to make them accessible to multical fits distinction between the value of referince by showing that his distinction between the a way as to make them accessible to moule. The same showed, here the statutes of the public a searching inquisition on every hand, the presumption remains in their favour unimpaired. No better advice than this can be given them. But how are they to follow it? Nineteen-twentieths have few or no reliable sources of information within their reach, and not one in a hundred can afford the expenses of a visit to Washington and a residence there for the purpose of consulting the Office records and library."

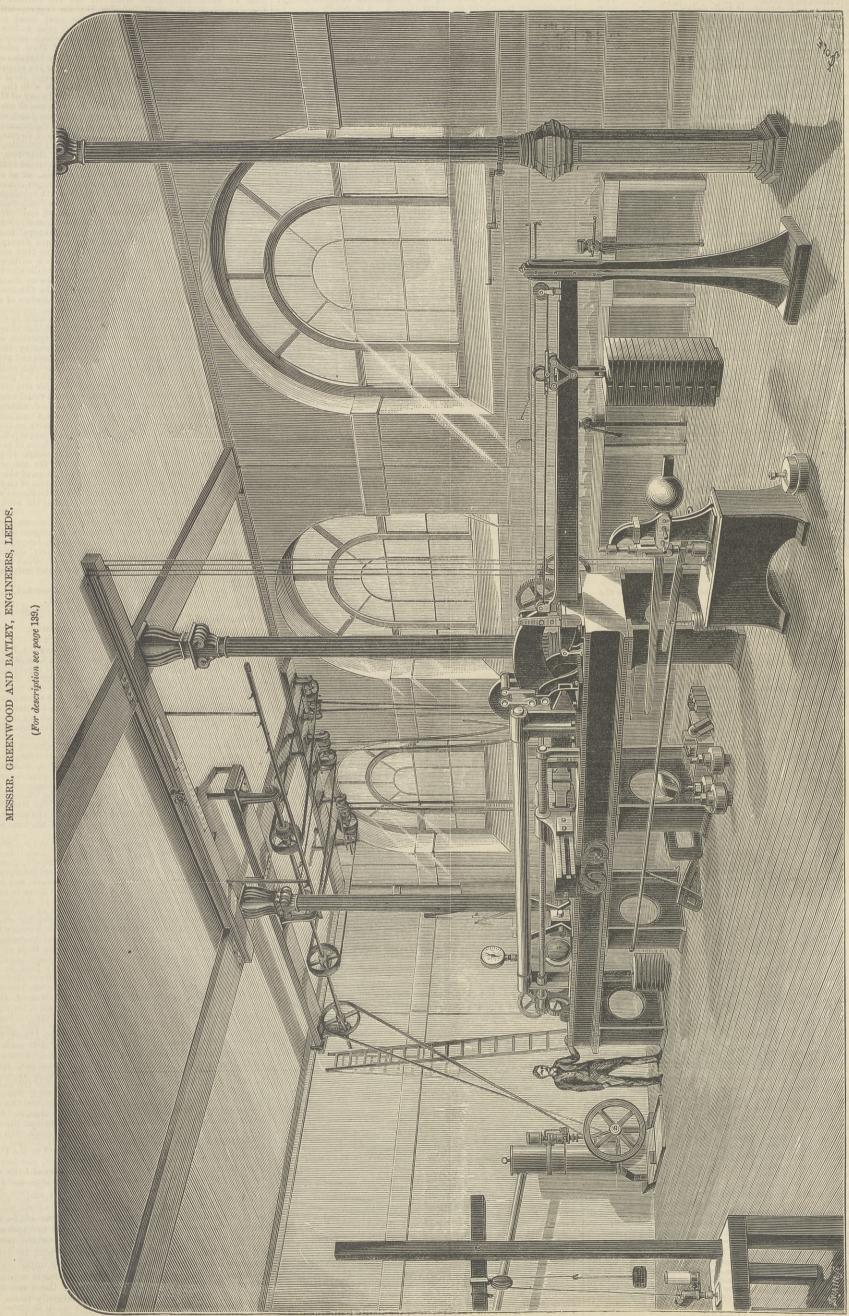
not one in a number can allord the expenses of a visit to Washing-ton and a residence there for the purpose of consulting the Office records and library." Each succeeding year has augmented the force of most of the reasons suggested by Commissioner Ewbank for the preparation of this index. It is impossible now to estimate the advantages which inventors, the puble, and this Office would derive from such a work if it were in the hands of the examiners and accessible to the public. The saving of time and money which would result from its use to the Office would be immense. It is, of course, impossible to estimate the millions that would be saved to inventors and to those who use inventions if the knowledge which it would furnish could be accessible to them. A work of such magnitude should not be undertaken without a most thorough consideration of the method to be adopted for its accomplishment. I earnestly com-mend this subject to the attention of Congress. At present appli-cations for design-patents are sent to the different examiners, according to the nature of the design. The law for this class of patents, of which about six hundred are annually issued, is special, and both it and the convenience of the Office, as well as the decisions of the courts, suggest strong reasons for their separation from all other work of the Office. The work of the Office would be facilitated and the practice improved by the establishment of a division for the examination of applications for design-patents and the appointment of a principal examiner to take charge of the division. I recommend such legislation as will accomplish this result. For reasons which are particularly set forth in my report made to the Secretary of the Interior, October 21, 1879, and submitted with his annual report to Congress, I also recommend the enact-ment of a law authorising the execution by United States com-missioners or by other United States officers of commissions issued by foreign Governments to take testimony in the United States, to be used he Office, therefore, cannot be relied upon to disclose the condition f the title to letters patent. As between *bond fide* purchasers for aluable consideration without notice, the priority of assignments hould, I think, be determined by the dates of registration; and I ecommend such a modification of the law as will accomplish this seult. The duties to be performed by the Assistant-Commissioner while

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ment ; the establishment of a division in some one of the executive

Hon. Samuel J. Randall, Speaker of the House of Representatives.

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THE ENGINEER.

FOREIGN AGENTS FOR THE SALE OF THE ENGINEER.

PARIS.—Madame Boyveau, Rue de la Banque. BERLIN.—Ashen and Co., 5, Unter den Linden. VIENNA.—Messrs. Genold and Co., Booksellers. LEIPSIC.—A. TWIETMEYER, Bookseller. NEW YORK.—THE WILLMER and ROGERS NEWS COMPANY, 81, Beekman-Street.

TO CORRESPONDENTS.

- *** In order to avoid trouble and confusion, we find it necessary to inform correspondents that letters of inquiry addressed to the public, and intended for insertion in this column, must, in all cases, be accompanied by a large envelope legibly directed by the writer to himself, and bearing a 2d. postage stamp, in order that answers received by us may be forwarded to their destination. No notice will be taken of communications which do not comply with these instructions. these instructions.
- *** We cannot undertake to return drawings or manuscripts; we must therefore request correspondents to keep copies.____
- *** All letters intended for insertion in THE ENGINEER, or containing questions, must be accompanied by the name and address of the writer, not necessarily for publication, but as a proof of good faith. No notice whatever will be taken of anonymous communications.

- proof of good faith. No notice whatever will be taken of anonymous communications.
 J. S. S. Probably you could get the information at the Office of the Local Government Board, Whitheall.
 H. T. H. The figures in the paragraph to which you refer were taken from the statement or speech of the chairman of the company to the shareholders at the recent general meeting.
 ENGINEER (Brecon). As a reply to your note of the 14th inst., you will find an article on the "Exhibition of Railway objects in Berlin," not Vienna, on page 145 of the present impression.
 E. P. (Batley). To augment the speed of the engine from 65 revolutions to 75 revolutions, the governors making 60 revolutions, you must diminish the driving pulley on the erank shaft or augment the governor will retain its present velocity. The engine now makes 13 revolutions while the governor makes 12, Assuming the diameter of the governor makes 12, and the diameter of the new conditions the engine will make 15 revolutions while the governor makes 12, and the diameter of the soft. As a diameter of the soft. This, or Goodeeves' Text Book on the Stame Engine," published by Lockwood and Co., price 5s., you should have, and for illustrations of engines could con, price 5s., you should have, and for illustrations of engines could be of use, to you. The last edition of Marray's Marine Stam Engine," by E. Elacada, and published by E. and F. N. Spon, deals chiefly with American practice, though engraings of many English engines are given. It is a book intended more for the engines on the drawing office, but might be of use to you. The last edition of Marray's Marine Engines and Steam Presels, "price adots at the adot intended more for the engine-to the drawing-office, but might be of use to you. The last edition of Marray's Marine Engines and Steam Presels, "price 3 of the soft way objected. The software to not it.
- affice, but might be of use to you. The last edition of Murray's Marine Engines and Steam Vessels," price 3s., Weale's Series, you should have if you have not got it.
 NEMO. We hardly understand your difficulty, but suppose that you wish to know what is the volume of a pound of steam at 100 lb, pressure. The load on a safety value is always greater than that put on by the weight or spring by the pressure of the atmosphere, say roughly 15 lb. on the square inch, for outside the boiler is air and inside it is steam, and the steam must have pressure enough to balance that of the air before it could lift the value, even weight on site of the safety value load—its real or absolute pressure is 100 lb. on the square inch.—the safety value load—its real or absolute pressure is 100 lb. on the square inch, and one pound of such steam will occupy a space of 433 cubic fet, or it would fill a vessel, shaped like a tea chest, and a little less than 1ft. Sin. high, wide, and deep. Used to small advantage in an engine, it will do work equal to lifting 58,273 lb one for high, or one pound 58,273/t. high, and used in a very good steam engine it might do more than three times as much, always supposing that none of it was condensed in the cylinder. We cannot give you any rule which would be of use to you for fluding the volume of steam at other pressure ; but that, and all other particulars, are to be found in tables privated in most tractises on the steam engine. If this does not answer your question write again.

CHEAP SUGAR PLANT.

(To the Editor of The Engineer.) (To the Editor of The Engineer.) SIE,—Can any of your correspondents send me particulars and prices of a cheap, effective complete sugar-making apparatus for small estates? A really economical apparatus is wanted to meet the requirements. The Concretor is too dear. Sugar.

HIGH-SPEED ENGINES.

HIGH-SPEED ENGINES. (To the Editor of The Engineer.) Stre,—Noting a letter in your last week's issue respecting Mr. Thos, Broad-bent's engine for hydro-extractors, I—as one interested in high-speed engines for the electric light and other purposes—should be glad if Mr. Broadbent will say at what speed he will guarantee his engines—hydro-extractors—to run in regular work, and if he can refer to places where they are actually at work, and also say how long the engines run at once, as I believe hydro-extractors only run for a few minutes at a time, and then rest during discharging and refilling. I have heard statements of his engines running 1500 revolutions, and again I have heard it stoutly denied that they run any such speed. J. Nottingham, February 21st.

THE WEIGHT OF CAST IRON SPUR WHEELS. (To the Editor of The Engineer.) SIR,—I shall feel obliged if you will kindly work out in full the follow-ing rule :—To find the weight of a cast iron spur wheel, say, 2ft, diameter, 4m. pitch, to the following rule, which is copied from Clark's "Manual of Rules, Tables, &c." (W = ('05 + '08 p) d \times (1 + '10d) February 21st. Young DRAUGHTSMAN.

[We comply with your request, and give you Mr. Clark's formula worked out in full. $W = (205 \pm 208 n) d \times (1 \pm 200)$

$$= [\cdot 05 + (\cdot 08) 4] 2 \times [1 + (\cdot 10) 2]$$

= [\cdot 5 + \cdot 32] 2 \times [1 + (\cdot 10) 2]
= [\cdot 5 + \cdot 32] 2 \times [1 + \cdot 2]
= [\cdot 10 + \cdot 64] \times (1 \cdot 2)

A GEOMETRICAL PROBLEM.

(To the Editor of The Engineer.) SIR,—In answer to the inquiry of "An Old Millwright" contained in your issue of the 18th inst., let x be the distance from the narrow end of the plate; area of plate, 180 square inches.

Then,
$$\left(8 + \frac{x}{9}\right) x = \left(12 - \frac{x}{9}\right) (18 - x),$$

from which $x = 9.891$ in. The length of cut will then be 10

·198in. $10.198 + 8 \times 9.891 = 90$ square inches. N. B.

1, Merchistow Bank-terrace, Edinburgh, February 20th.

(To the Editor of The Engineer.) SIR,—The following is a solution of the problem proposed by "An Old Millwright:"—As the weights of the two parts, into which the plate is to be divided, are to be equal, so the areas must be equal—that is, each of the parts must have an area of 90 square inches, the area of the whole plate being $180 = \frac{12 + 8}{2} \times 18$. The area, length and mean breadth, and the breadth in inches at any length L from the narrow end is $(8 + \frac{2}{3} L)$ The mean breadth of a part of length L is $\frac{(8 + \frac{2}{9}L) + 8}{2}$. Then, by solving

the equation $L \times \left(\frac{8 + \frac{3}{9}L + 8}{9}\right) = 90$, which comes out a quadratic, we 2 find the length L, measured from the narrow end, required to give an area of 90 square inches, is 9:89in., length 9:89in., mean breadth *8 + # y 9:89 = 9:099, area = 89:989, a result sufficiently accurate. Dumbarton, February 21st. M. P.

(To the Editor of The Engineer.

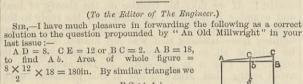
(To the Editor of The Engineer. SIE,—In answer to "An Old Millwright's" query, I beg to reply he can arrive at what he wants as follows, viz. :—Suppose plate to be as per sketch, A B C D. Bisect A D in E, and bisect B C in F, join E F and produce it until it meets A B, also produced at G, the length of the line E G will be 54in, and the area of the semi-plate A B F E will be 90 square inches under "Millwright's" proposed problem. The area of triangle B F G will be 72 square inches. The solution therefore required is to construct a triangle of 72 × 45 = 117 square inches on the line E G, with

G as vertex, and the perpendicular will cut the plate as "Millwright' wants. Suppose x = length of the base and y = length of perpendicular, then by the properties of similar triangles $\frac{x}{y} = \frac{54}{6} = 9$ $\therefore x = 9y$, but $\frac{x}{2} = 117$, x = 234, Substitute value of $x \cdot 9 y^2 = 234, y^2 = 26$.

 $y = \mathbf{v}$ (26). Substitute value of $y = \frac{x^2}{9} = 234$ $x^2 = 2106$ $\therefore x = \mathbf{v}$ (2106) measured to the left from G. I will not occupy your valuable space by

C n---->C

working out these square roots, which "Millwright" can do for himself. 132, Stockwell-road, S.W., February 21st. W. J. HETHERINGTON.



have $A B : B C :: A b : b c = \frac{B C \times A b}{A B}$. But

A $b \times b c =$ the areas of the triangles A b c and D e f, whence als $\frac{B C \times A b}{A B} \times A b = \frac{B C \times A b^2}{A B} =$ sum of the areas of the triangles A b cand D e f. Again, the rectangle D f b A, together with the adjacent triangles, is equal to half the area of the whole plate ($=\frac{180}{2}=90$ square inches) by the question therefore $\frac{B C \times A b^2}{A B} + A D \times A b = 90$, quadratic equation. Now, if we let x = A b, and using the figures given, we shall have $\frac{2 x^2}{18} + 8 x = 90$

$$x^2 + 72 \ x = 810$$
.
pumpleting square and extracting root $x + 36 = 45$ '89 nearly. $\therefore x = 9$ '89 in
ngth required. JAMES TOMKINS.
Moorfield Ironworks, February 19th.

(To the Editor of The Engineer.) Sir, -I send "An Old Millwright" an algebraical solution, as requested, of the above. Let x = distance from narrow end to cut in inches.

$$\frac{2x}{9}$$
 = increase in width at cut.

$$\therefore 8 + \frac{2\pi}{9} =$$
width at cut.

Ce

Now

Or w

$$\frac{1}{2}\left(3+3+\frac{2x}{9}\right) = \frac{12+x}{9} = \text{mean width of piece with narrow end.}$$
$$x\left(\frac{72+x}{9}\right) = \text{area of this piece.}$$

$$\left(12 + 8 + \frac{2x}{9}\right) = \frac{90 + x}{9} = \text{mean width of piece with broad end.}$$

$$\frac{30+2}{9}$$
 = area of this piece

these two areas are equal by supposition

$$\therefore x \left(\frac{72 + x}{9}\right) = \frac{(90 + x)(18 - x)}{9}$$

$$x^2 + 72 x = 810$$

x = 9.89in.

$$x\left(\frac{72+x}{9}\right) = \text{half the area of the plate} = 90$$

$$\therefore x = 9$$
'89in.
Ipswich.

[We have received several other solutions which we deem it unnecessary to publish,—ED. E.]

E. J. CHAMBERS.

SUBSCRIPTIONS.

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MEETINGS NEXT WEEK.

MEETINGS NEXT WEEK. The INSTITUTION OF CIVIL ENGINEERS.—Tuesday, March 1st, at 8 p.m.: Discussion on "The Weight and Limiting Dimensions of Girder Bridges," and, time permitting, the following paper will be read ;—"Tide Gauge, Tidal Harmonic Analyser, and Tide Predictor," by Sir William Thomson, P.R.S., L. and E., M. Inst. C.E. —Themcar Scottery.—Thursde, March 8rd, at 8 p.m.: "On the Action of Bacteria on various Gases," by Mr. F. Hatton. "On the Oxidation of Organic Matter Running in Water," by Dr. C. M. Tidy. "On the Action of Aldehydes on Phenanthrine Quinone in presence of Ammonia" (second notice), by Dr. F. R. Japp and Mr. Edgar Wilcock. "On the Action of Benzole Acid on Naphtha Quinone" (preliminary notice), by Dr. Japp and Mr. N. H. J. Miller. Society of Arrs.—Tuesday, March 1st, at 8 p.m.: Foreign and Colo-mial Section, "The Languages of Africa," by Robert N. Cust. Wednesday, March 2nd, at 8 p.m.: Ordinary meeting, "Lighthouse Characteristics," by Sir William Thomson, LL.D., F.R.S. Friday, March 4th at 8 p.m.: Indian Section, "The Results of British Rule in India," by Mr. J. M. Maclean.

THE ENGINEER.

FEBRUARY 25, 1881.

THE LANGUAGE OF PHYSICAL SCIENCE. THE time has very nearly arrived when those who undertake to teach the world that which is known as science must authoritatively define the meaning of the words which they employ to denote facts and conditions. This proposition may be, and probably will be, disputed by many; but those who, belonging to no special school of philosophy, can judge impartially of the merits and demerits of various systems of imparting instruction, will, we feel certain, agree with us that some considerable changes are necessary in the use now made of particular words; and the fact that such a change is necessary will be rendered in a moment apparent by suggesting to anyone accustomed to a particular mode of thought, that the use he makes of a given word is not the use of it made by another, and that he ought to adopt the system which contrasts with his own. He will stoutly maintain that he and his school are alone right, and that all others must be wrong. Not only does the want of unanimity of definition weaken the instruction given by those who teach, but it acts as a direct hindrance to the progress of science. Indeed, there are not wanting indications that much which has hitherto been supplied for the mental digestion of the student in, so to speak, crude, uncooked lumps, must in the near future be qualified and prepared for mental assimilation. There is still too great a tendency to use a great name as sufficient excuse for putting forward a startling statement, or an inconsequent conclusion. To the objection that such and such a thing is perhaps not true, or that it seems to involve a contradiction, it is deemed answer sufficient, "Newton said it," or, "It will be found in Rankine." It is high time that this kind of argument was displaced for ever, and that, in its stead, we should have accurate definitions which might be generally accepted as sound.

Nothing, unfortunately, is more easy than to give examples of the defects of which we speak. On every side we find words and names used in the vaguest possible way by men who it is presumed have been trained to speak and think with accuracy, as well as by those who are not supposed to attach any special importance to the meaning of the words they speak. Let us take for instance the words "matter" and "motion." If we ask twenty men of average education to define what motion is in a very few words, they will break down. If we turn to the text books, which are supposed to put dynamical facts before us in the most precise shape, we shall fare very little better. Taking books from our shelves at haphazard, we have first "Parkinson's Treatise on Mechanics," published in 1874. Dr. Parkinson is tutor and predector at St. John's, Cambridge, and on the whole his book is a very excellent work. "A general notion," he writes, "of the term 'matter' is acquired in the daily experience of life, since matter in various forms and under various circumstances is perpetually affecting our senses; we shall therefore assume that the notion of it is familiar to the student." We might almost imagine that this extract was taken from a book a century imagine that this extract was taken from a book a century old. Dr. Parkinson would have done better to have held his peace on the subject of matter than write thus vaguely about "general notions." Long before 1874 there were to be found hundreds of persons who held, as they hold now, that matter is incapable of affecting our senses at all, much less of "perpetually affecting" them, and that we know nothing about it save what we learn from its motions. Concerning motion, Dr. Parkinson writes : "When a body or particle constantly occupies the same position in space it is said to be at rest, and when its position in space changes continually in any manner whatever it is said to be in motion." We shall not quarrel with this latter definition. Further on in the same work we have : "When the position of a particle relative to certain fixed points is being altered it is said to be in motion." The idea intended to the interval is said to be in motion." The interval to be conveyed here is the same, and the word is used to mean the phenomenon of change of place. In Weisbach's "Mechanics of Engineering" we have, "Every body occupies a certain position in space, and a body is said to be at rest when it does not change that position; and on the contrast when it does not change that position; and on the contrary, a body is said to be in motion when it passes continually from one position to another." Further on, "Matter is that by which the bodies of the exterior world act upon our senses. Mass is the quantity of matter which makes up a body." Of "mass," Parkinson declines to give a definition, "forsuch definitions as might be given would be as illusory as those which might be given of time, space, and many other species of magnitudes." But as it is impossible to write about dynamics without dealing with mass, Dr. Parkin-son further on defines equal masses thus :---"The masses of son further on defines equal masses thus :---- The masses of two particles are said to be equal when two equal forces acting on them for the same time generate in them equal velocities. If we turn to Clerk-Maxwell's "Theory of Heat" we fail to find any definition whatever of motion; and he apparently goes out of his way to avoid using the word "matter" matching clower of "to avoid using the word "matter," speaking always of "a body" or of "bodies" instead. We could go on with ease were space available, quoting from author after author, to show the sense in which they define matter and motion;

but we have said enough for our purpose. Now, so far as dynamics and statics are concerned, the word "things," used in their popular and substantial sense, would answer as well as "matter." "Bodies," as employed by Clerk-Maxwell, is a better word, and can cause no confusion of ideas. The great objection to the use of the word "matter" is that it is employed by chemists to express the elementary state of something which has certain powers, intrinsic or conferred, of making itself evident in diverse or similar ways to the senses. Thus, for example, oxygen is assumed to be one kind of matter, hydrogen is another kind of matter, and water is a mixture of the two; but a hypothesis which deserves attention has recently been growing up into life, namely, that there is but one form of matter, and that oxygen, hydrogen, and other elements, are but

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this matter presenting itself to our senses under varying It does not appear that any dynamical truth conditions. is concerned with the word matter, and we confess that we ourselves are disposed to reject it altogether as a term in dynamics, and retain Clerk-Maxwell's "body" instead. Turning from matter to motion, we shall find that there is not more need four yet more need for sound and accurate definition. have seen that motion is defined as continuous change of place; but it is impossible to take up any treatise on dynamics without finding that this definition is wholly insufficient and incomplete. For in all treatises we meet almost in the first pages with the term "momentum," which is algebraically expressed as Mv, and we are told that it means "the quantity of motion in a body." Read literally with the only definition of motion in a body. Read interally this means, "The quantity of the continuous change of place of a quantity of matter." Fully impressed with the glaring absurdity of this sentence, some writers insist that momentum means not quantity of motion, but quantity of velocity; but in neither case is the mind able to deduce any meaning from such words. We might with just as much propriety speak of a pound of space or a yard of sound. It is quite clear, therefore, that when a quantity of motion is spoken of, something is meant which has not been defined under the head "motion," and accordingly we find that Mv is purely an algebraical expression intended to state the law determining the conditions under which a given quantity of matter moving at given velocity can alone be brought to rest. all the purposes of instruction, motion can be dealt with here as a definite entity, and its quantity can be spoken of with strict propriety; but it is quite certain that the idea of the motion of whose quantity we can thus speak involves something more than a conception of continuous change of place. It is a noteworthy fact that for some time a contest raged between two rival parties as to whether momentum was to be written Mv or Mv^{*} , which has, perhaps, never been paralleled in the scientific world for bitterness. It is only within comparatively recent times that it has been agreed that it shall be written as Mv; and even yet some works on dynamics may, we believe, be found in which Mv is used to indicate mass, $\frac{1}{2} Mv^*$ being employed to denote momentum, although it really means something quite different.

Another proposition met with in nearly all treatises on statics and dynamics is that "action and reaction are equal and opposite". It will work the and opposite." It will probably not take the student long to master this apparently very simple and self-evident proposition; but if he will only carry it to its logical conclusion, and proceed to apply it to any one of the problems which are subsequently put before him, he will find either that the proposition in its unqualified sense is absurdly untrue, or that something remains to be explained concern ing which text-book and tutors are alike silent. If the actions and reactions of bodies on each other are equal and opposite, then it is certain that no body can possess the power of affecting in any way the condition of another body. Thus, for example, if the reaction of a ship is equal and opposite to the thrust of the propeller, then the propeller cannot cause her to move. If the reaction of a train is equal to the will of the groups them the loss train is equal to the pull of the engine, then the locomotive cannot haul it. As the student gets on with his studies, however, he will find it very clearly stated that not only is the action and reaction theorem a mathematical proposition, but an absolute fact; and he will learn that the resistance of a train is at all times exactly equal to the pull of the engine, and that the thrust of a screw shaft is exactly equal to the resistance of the ship. It is not our business now to explain why under the circumstances a ship or train moves, but it is surely almost time that writers and lecturers gave the necessary explanation to their students. As the proposition stands, it may be put thus to two boys :—If Tom push against John as strongly as John pushes against Tom, neither boy will move. Tom and John will very quickly understand the proposition ; they will in a moment grasp the sense of "action and reaction are equal and opposite." But when they find after-wards that although the pull of a locomotive is not one grain greater than the resistance of the train behind it— for if it ware then would the pull of a set and and after for if it were then would the pulls at each end of a coupling be unequal, which is manifestly impossiblethe train is made to move by the engine, they will ask how this thing can be; and we can assure them that so far as any text-book with which we are acquainted is con-cerned, they will go unanswered. Here is an omission which may well be filled up; for the proposition that action and reaction are equal and opposite, is of very great import-ance, and ought to have its meaning very explicitly defined.

As to the word "force," we confess we approach it with the utmost hesitation. It is continually used by every one, and almost invariably in a vague and purposeless kind of way, which is very wearisome. We are repeatedly asked, with what force a steam hammer of a given weight will strike a blow with what force a shot hits an armour plate ? and so on. Now it so happens that the scientific world at present bids fair to be split into two great sections; one led by no less an authority than Professor Tait apparently maintaining that there is no such thing as force, while the other side are by no means unanimous in defining it, or in explaining what they mean by the word. Maxwell defines force as "whatever changes, or tends to change, the motion of a body by altering either its direction or its magnitude." This by no means explains what force is, but only expresses one attribute of it, another attribute being the property by virtue of which "a force, acting on a body, may be measured by the momentum it produces in its own direction in a unit of time." Parkinson writes :—" The following principle we assume as being in accordance with experiment and obser-ution wire a particle which is a backtable at most write vation, viz., a particle which is absolutely at rest will continue so until some cause extraneous to itself begins to operate so as to put it in motion. This principle asserts that matter at rest has no tendency to put itself in motion, and that any motion or tendency to motion which it may were required. The total horse-power of an engine, it may perhaps be well to explain, is the indicated horse-power, help us much. The words, "tendency to motion," are especially unhappy. They have been obviously introduced

to meet the difficulty that a force may not produce motion ; but to speak of the tendency to motion which a body may ossess is quite inaccurate, inasmuch as the body is perfectly inert, and can have of itself no tendency to move one way or the other.

It may perhaps be urged that in writing thus we are making mountains out of molehills, and that all the facts and truths of science can be, and are, taught quite well, in spite of ambiguity of language. To this we take exception. The laws of statics and dynamics are not well taught now, because sufficient importance is not attached to the use of accurate language. It is univer-sally conceded that Clerk-Maxwell is in his own path an unrivalled writer, while the same may be said of Huxley, dealing with a different branch of science. Why In what does the excellence of Maxwell's style is this? consist? If we take his treatise on the theory of heat, and examine it carefully, we shall find the reply to this question very clearly set forth. He tells his readers hothing new—nothing that was not known before; but he tells it all in language which is amazing in its accuracy. But it is impossible at the same time to avoid seeing that Maxwell has in this particular work, as in others, passed over in silence much about which he could not speak, because no language which he possessed could convey accurately what he meant to convey way that would be generally intelligible. truth is, that many men of comparatively high attainments in science have very vague ideas of such things as "force," "momentum," "energy," "work," and such like. To say for example, that a force is that which does certain things and to treat it accordingly, may suffice for many practical purposes, but it does not tell us what force is. Such a definition goes no nearer to the truth than the statement that a locomotive engine is that which draws a train. This obviously leaves the previously uninformed in complete ignorance of what a locomotive engine is. Our knowledge of molecular physics is extending day by day. We are week by weekwe had almost said hour by hour-brought face to face with new and extraordinary discoveries. At one moment we have the radiometer of Crookes; then comes What next? We cannot tell—no man can; but in this world of change, the old things passing away, and giving place to new, it it highly expedient that no war about words should be fought. Ideas should be definite, and the words into which they are crystallised should be as translucent as the diamond. Clear thinking makes clear writing; but in the world of science there can be neither the one nor the other, in the fullest sense of the term, until much that is now vague has been accurately defined.

THE EFFICIENCY OF A TANDEM ENGINE.

MR. M. LONGRIDGE, chief engineer to the Engine, Boiler. and Employers' Liability Insurance Company, has just published a detailed account of a series of experiments published a detailed account of a series of experiments which he has conducted to ascertain the economic efficiency of a compound engine and boiler, at Oak Mills, the property of Messrs. Thomas Nuttall and Sons, Farnworth. This report contains 24 pages, and is well illustrated by litho-graphs. Its contents will, no doubt, be read with interest by many engineers. The object of the experiments was, Mr. Longridge tells us, first, to measure the different quantities of steam used by the engine per indicated horse-power per hour, when working with boiler pressures of about 80 lb. and 60 lb. per square inch; and, secondly, to ascertain the effect of varying the ratio of expansion in the larger cylinder, so as in one case to cause the back pressure on the smaller piston to coincide with the terminal pressure, and in the other to cause a check or break in the expansion curves on the opening of the high-pressure exhaust ports. Unfortunately, however, the latter inquiry could not be carried out, because the point of cut-off in the large cylinder could not be altered sufficiently to enable any definite results to be obtained. Those of our readers who wish to know in detail how the experiments were made, we must refer to the report itself. It must suffice to say here that the trials extended over several days, and were made in the most approved manner, the discharge from the condenser, and its temperature, being measured on the Donkin and Farey system, while the quantity of feedwater actually pumped into the boiler was also measured by means of two coupled casks. The engine is of by means of two coupled casks. The engine is of the compound tandem type; the high-pressure cylinder is 27in. in diameter, and the low-pressure cylinder 45in.; the stroke is 6ft.; number of revolutions, 42 per minute, corresponding to a piston speed of 504ft. per minute. high-pressure cylinder is fitted with Corliss valves, worked by trip gear under the control of the governor. The low-pressure cylinder has double Meyer slides, one pair at The each end of the cylinder. The cylinders are a considerable distance apart, at least 4ft. intervening between the back lid of one and the front lid of the other; a bent steam pipe with a capacity of about 22 cubic feet acts the part intermediate receiver. The boilers are two in number, of the Lancashire type, each 28ft. long by 7ft. in diameter, with two internal flues in each 2ft. 84in. diameter. The total heating surface is 1830ft. A Green's economiser, working in connection with the boilers, has 1200 square feet of surface. The total is thus brought up to 3030 square feet.

It is a noteworthy fact that neither of the cylinders is jacketted; they are well clothed, and the covers are highly polished. It does not appear at first sight that there is anything about the engine calculated to promote extreme economy. It will surprise many of our readers, therefore, to hear that, according to the report before us, it required during a seven hours' trial, carried out on the 6th of Octo-ber, but 16.7 lb. of feed-water per I.H.P. per hour; and deducting the weight of water carried over from the boiler in the form of insensible priming, only 15:32 lb. of water were needed, while for each total horse-power only 12:73 lb. were required. The total horse-power of an engine, it may perhaps be well to explain, is the indicated horse-power,

this type of engine the figures we have given are un-paralleled. We have no authentic record of a tandem engine with unjacketted cylinders working with non-superheated steam conveyed through a considerable length of steam pipe, giving out a horse-power for less than 17 lb. of feed-water per horse per hour; and it is worth notice that Messrs. Nuttall's engine was unable to repeat the performance during any of the succeeding experiments of the trial, the consumption of feed-water rising to 16.81 lb., 18.02 lb., 18.14 lb., and 18.27 lb. To what are we to attribute the exceptional performance of this engine? We shall confine our attention to the performance of the 6th of October only.

Mr. Longridge supplies no information as to the ratio of expansion other than what can be gathered from the diagrams, selections from which he publishes. These are very good, and of the familiar Corliss type. It appears very good, and of the familiar Corliss type. It appears from them that on the 6th of October the initial absolute cylinder pressure in the small cylinder was 87 lb. on the square inch, and the expansion was very nearly, but not quite, 3.8 to 1. In the low-pressure cylinder the initial absolute pressure was a fraction over 21 lb., and the ratio of expansion to admission was again a little less than 35 to 1. We shall be very close to the truth, therefore, if we take the total expansion as 13 to 1. It is worth notice that notwithstanding the comparatively large intermediate receiver, the drop between the diagrams is small; the initial pressure in the small cylinder being only about 3 lb. higher than the initial pressure in the large cylinder. Inasmuch as the number of cylinders in which steam is overcond in pressure in the small of the state of the expanded in no way affects the theoretical efficiency of the steam expanded, we may refer the whole of the work to the large cylinder. The space swept through by the piston per stroke, including clearance, is 133.8 cubic feet within an unimportant fraction. One-thirteenth of this space, or 10.3 cubic feet, must be filled at each stroke with steam having an absolute pressure of 87 lb. on the square inch, and for 84 strokes we have 866.52 cubic feet per minute. The weight of a cubic foot is 2024 lb., and it follows that the total weight of dry steam used per minute must be 175.12 lb., or per hour in round numbers 10,507 lb. The engine indicated 492.6-horse power, and the consumption would therefore under the conditions have been 21.3 lb. nearly per indicated horse-power, and this on the assumption that there was no cylinder condensation during admission. It will be seen from this that there is something about Mr. Longridge's figures which require explanation.

Proceeding in another way, and measuring the actual length of the admission portion of the diagram of the high-pressure cylinder, we find that the steam valve closed at one-fourth of the stroke. This being the case, we find by similar a calculation to that given above that the consumption of steam cannot have been less than 29,535 cubic feet, weighing 5978 lb., per hour. This is equivalent to 12.13 lb. of steam per horse-power per hour; deducting this from 15.32 lb., the recorded consumption of dry saturated steam, we have but 3.19 lb. per horse-power per hour to meet all losses of every kind; and we confess that it seems to us to be simply incredible that in the cylinders of an unjacketted condensing engine the loss by condensation should have been so insignificant. Testing the consumption in yet another way, we find that the initial pressure in the high-pressure cylinder being 87 lb., if but one-fourth of the cylinder and clearance were filled, the terminal pressure could not have exceeded 21.75 lb. absolute; it was actually 26 lb. at the front end of the cylinder, and within a minute fraction of 26 lb. at the back end. But this corresponded to an admission of at least $\frac{1}{3^{\circ}3^{\circ}4}$ instead of one-fourth, and the consumption of steam must consequently have been very nearly 14 lb. per hour by the indicator, leaving 1 32 lb. only to meet condensation and every loss. We say, without the slightest hesitation, that such a result is simply impossible to attain even in jacketted cylinders. It could only be had in an engine supplied with steam so far superheated that cylinder condensation was all but entirely prevented.

Dividing the initial pressure, 87 lb., by the terminal pressure, which is by the diagrams a little over 7 lb., pressure, which is by the diagrams a little over 7 lb., we have a total expansion of approximately, 12 to 1. This, referred wholly to the low-pressure cylinder, gives an average pressure of 1 + hyp. log. 2.48 = $3.48 \times 87 \div 12 = 25.23$ lb., and the power developed would be 579-horse power, instead of 492.6. The difference is of course due to the gap in the diagrams, but this fact in no way affects our argument. It cannot be contended that, because it was possible if all the steam had been expanded in one cylinder the power would have been in excess of that actually developed, that consequently excess of that actually developed, that consequently there is nothing abnormal, or more than was to have been expected, in the results obtained. Had 87 lb. steam been expanded twelve times in one cylinder only, the consumption of steam would have been much only, the constitution of steam would have been inten-greater than it was, with a corresponding augmentation of power developed. The consumption of steam per horse per hour would then have been $11,379 \div 579 = 17.92$ lb. Thus it will be seen that, no matter in what way the calculation of the power of the engine is made, we are met by the fact that the total consumption of steam must have been either in excess of that stated by Mr. Longridge, or within a small fraction of the consumption, as shown by the indicator diagrams, no margin worth naming being left for condensation or leakage. Under the circumstances, we are compelled to the conclusion that Mr. Longridge's figures require revision. The most natural hypothesis is that some mistake was made in the measurement of the feed-water. This view is strengthened by a statement made by Mr. Longridge himself to the effect that on one day—namely, the 8th of October—although 5760 lb. more water were evaporated than on the previous day, no more coal was burned. The explanation of this phenomenon supplied by Mr. Longridge seems to us to be quite inadequate. He attributes it to the fact that, on the day of best evaporation, a damper, the existence of which

consumption of fuel was reduced by three tons a week-is Mr. Longridge, indeed, states definitely not conclusive. that, with the damper up, no more coal was burned than when it was down. This requires explanation. There is no more fruitful source of error in experiments of the kind than in the measurement of the feed-water; and the measuring apparatus in this case seems to have been well enough contrived; yet Mr. Longridge admits that some difficulty was experienced in regulating the supply from the water company's main. It is true that the time when each barrel was emptied was noted by one of Mr. Longridge's men, while an independent note was made by a servant of the Bolton Water Company; but in the multitude of observers wisdom is not always found. We are told that each of the two measuring barrels was found "by measurement" to hold 90 gallons. We invariably find measurement in such cases to be liable to error, and it would have been much more satisfactory if their contents had been found by weight. We presume the barrels are still available. If so, Mr. Longridge would do well now to check them by weight. As we have said, the reported performance of the engine is quite abnormal, and Mr. Longridge must pardon us if we call upon him to supply special proof of its accuracy. Had such an engine been jacketted, all experience goes to show that not than 1.5 lb. of water per horse per hour would have been condensed in the jacket, representing a saving of double as much in the engine. This would have brought down the consumption of dry steam ostensibly to less than 12 lb. per horse per hour—a physical impossibility.

PALLISER GUN EXPERIMENTS.

WE have invited criticism on the proposed continuation of the Palliser gun experiments. We have since heard some strong and well-considered objections expressed by those whose opinions ought to carry weight, expressed by those whose opinions ought to carry weight, which we will endeavour to put before our readers. In the first place it is objected that pebble powder ought not to be used in a gun of this calibre; that it is well known that very large charges of pebble powder have given comparatively low pressures in guns of 7in. calibre. It is not urged that Sir W. Palliser ought to use Rifle L.G. powder. Probably no one who understood the question would risk the reputation of a gun of his own so far as to expose it to such an ordeal as this; but it is suggested that some impartial opinion should be taken as to the class of powder that would behave in the same way in this gun that pebble powder behaves in a gun of 12in. calibre. To the suggestion that the use of pressure gauges sufficiently meets this requirement, it is replied that they will, under the circumstances, fail just when they are needed; that in the case of the Thunderer gun, the front pressure gauge was forced far beyond its power of registering gauge was forced far beyond its power of registering pressure, while the record obtained by the hinder gauge is of little value, it being known that the pressure is not excessive behind the posterior projectile. Further, it is urged that the whole drift of the trial is on a wrong track—that whether a gun will or will not stand double loading peculiarly well is an out-of-the-way question, something, it is urged, like such a question as whether a riding man's hunter could swim well. It is true that under conceivable circumstances a man's horse true that, under conceivable circumstances, a man's horse swimming well might save his life. He might, for example, have been tempted to ford a dangerous river. Still, it is very questionable if such a man would in future life make the swimming powers of a horse a leading recommendation. He would be more likely to use caution in fording rivers for the future. So, it is urged, with the gun. On one occasion it has been shown that a gun was double loaded ; but it is considered that this should be absolutely prevented for the future not provided for • for the future, not provided for. The provision of strength in the portion of the gun where the chief strain in a case of double loading falls, means that the metal is not applied to the best possible purpose for the normal condition of things on service, including even all the irregularities that ought to fall within the margin of probability, or even of possibility, for the future.

The Palliser gun, it is admitted, would probably bear such a test as plugging up the bore from the bottom, and firing a charge in a more advanced position by drilling a new vent further forward. In fact, the bore might very likely be filled up till a cartridge and shot were fired near the muzzle without injuring the gun, because, as we pointed out in THE ENGINEER of March 5th, 1880, the coiled tube which bears the main tangential strain extends in unbroken thickness and strength from muzzle to breech. But this, it is urged, is only a proof of the mis-application of strength, easily explained no doubt in the se of the Palliser converted guns, but certainly a defect rather than a beauty in any original design, because this strength would be better applied elsewhere; further, that is uncertain and remote. In fact, it is urged that the trials will rather have the tendency of misleading the public mind than informing it rightly. To this we should suppose Sir W. Palliser would reply, that any disadvantage arising from unnecessary strength of course must take either the form of extra weight or else of diminished strength in some other part of the gun, that any such objection must have made itself apparent and had its weight in all the trials of his guns for service, and that if an actual incident arises on service which brings out some peculiar advantage possessed by his guns, it is only fair and reasonable that he should establish such a fact; but that he does not admit that the strength of his guns is simply due to the continuation of thick wrought iron tubes from end to end, that he lays special stress on their application in the form described in THE ENGINEER of March 12th, 1880 of a loose lining which expands and absorbs the dynamic strain falling on it much better than similar coils under continual stress of shrinkage, and that any objection as to difference of calibre will be at once disposed of if he is permitted to carry out his proposal to make a Palliser gun of the stump of the Thunderer gun itself.

We have endeavoured to state the objections as well as we can, and to supply what we conceive would be the sort

of answer Sir W. Palliser would make, but it should be explained that he has not been consulted at all by us; we only argue on his original position as to this question. Personally, while admitting the general force of many of the objections which we have stated on a former occasion, were we in Sir W. Palliser's place, we should fire the gun in any way that would really test its powers of endurance. Once we found public attention was called to the matter, and that just at a time when we had a gun that we could afford to expend, and what we believed would display great powers of endurance, we should certainly expend it. We think, indeed, that any enterprising man in such a position would do so. The main question would be how to employ tests that would satisfactorily show the actual strength of the piece. This is why we should certainly fire in such a way as to get trustworthy records from the pressure gauges before we burst the gun. For when this actually occurs we question whether the pressure gauges will do their work. The actual burst will be interesting in other ways; for example, if the common shell bottom gives way, and the shell wedges and apparently assists to burst the gun violently, it will go to support the belief that both the Thunderer guns suffered a more violent strain than would even be produced by double-loading with solid projectiles. The condition of the iron in the coils and the number of fragments and the like may all yield instruction; and if Sir W. Palliser is willing to burst his gun, we do not see why there is any necessity for any of us to deduce erroneous lessons from it.

THE NORTH-EASTERN RAILWAY.

THE NORTH-EASTERN RAILWAY. THE report and balance-sheet of the North-Eastern Railway do not show much inclination on the part of the directors to under-take those large works which some well acquainted with the terri-tory it serves deem needful. The company expended last half-year on capital account £172,723, or with the amount deducted for pro-perty sold, £197,415, and it proposes to expend in the half-year now entered on £364,856. The great bulk of the increase is in the lines and works open for traffic and in the additional rolling stock. Last half-year it bought no new rolling stock; this year it proposes to expend £100,000 on additional stock. It anti-cipates that the railway and dock works at West Hartlepool will be completed in the current half-year; and it will then have only two works of magnitude in progress—the Whitby, Redcar, and Middlesbrough Railway, on which £124,257 have been and £119,603 remain to be spent, and alterations of roads and lines at Stockton, including the bridging of the Tees, which has cost £55,104, and is yet to cost £68,580. The North-Eastern purposes to expend £4000 during the half-year on lines not yet com-menced, chiefly on the Tyne, but as these are estimated to cost £199,700, it can scarcely be said that the works will be fairly antered unce. Two the conversion of the North-Fastern $\pounds 199,700$, it can scarcely be said that the works will be fairly entered upon. Turning to the experience of the North-Eastern in the past half-year, it may be added that whilst there has been a very large addition to the revenue—not less than £355,000— yet the addition to the expenditure—£186,000—has been more than proportionate. In the passenger traffic it is worth note that there is a falling off of 54,000 in the number of second-class passengers, whilst the first-class have increased 17,000 on the half-year, and the third-class by the enormous number of 1,050,000—the receipts in each case moving correspondingly. The company has had to expend £15,000 in the half-year on coal and coke for locomotive uses, and nearly every other item of expenditure has risen correspondingly in like proportion. Turn-ing then from these figures, it may be said that in the report and the statement of accounts as a whole, there is evidence of that wonderful growth which is charac-teristic of most railways, and especially of mineral railways, in the past year. It is evident that, though it was for the moment checked by the results of the stormy and intensely fosty weather, we shall see in the course of a short time a further growth of that traffic which has swollen so in the past few months. That the that traffic which has swollen so in the past few months. That the North-Eastern Railway Company expects this is evident from its intention to expend £100,000 in additional rolling stock. But with so vast a district elamouring for additional facilities, this is not enough. North Northumberland is entreating it for railway facilities; Tyneside complains that it is scantily served; Sunderland is openly entreating the Midland to send a branch through to rescue it from monopoly; the Hartlepools complain that their facilities for traffic are proportionately less than fifteen years ago, when they were provided by an independent company; and in Cleveland there is such a revolt that the Railway Commisand in Cleveland there is such a revolt that the Railway Commis and in Cleverand there is such a revolt that the ranking Commis-sioners are likely to be appealed to. It is evident that this is the policy that is losing Hull to the North-Eastern Railway; and it is also evident that if it does not speedily alter its policy that North, from which the bulk of its revenue is derived, will be in danger of being lost to the railway that has now a monopoly fits or the railway that has now a monopoly of its service. In its own interest, as well as in that of the district, it is to be hoped that the North-Eastern may speedily discover that the liberal policy is the best in this as in all other similar cases.

THE EXHIBITION OF RAILWAY PLANT IN BERLIN.

THE idea of a special exhibition of this character was originally onceived and proposed in the Austrian Oest Eisenbahn Zeitung of the 1st August last year, but beyond the formulation of a comprehensive programme, 'no further steps have been taken towards its realisation. The Berlinese with the spirit of rivalry which has ever existed between the inhabitants of the two imperial cities since the re-organisation of the German Bund, have adouted the suggestion : and while the Vienness were hold have adopted the suggestion ; and while the Viennese were hold-ing meetings to deliberate on the advisability of forming a com-mittee to consider the question, have quietly stolen a march on their more deliberate competitors, and decided that the time has at last arrived for them to emerge from their long-imposed reticence, and that an international exhibition of railway plant whether the novelty of the idea be due to themselves others — affords the most befitting opportunity of declaring to the world their readiness to re-enter the lists of industrial competition. It was at first decided to hold the exhibition in 1882, and to confine it purely to details connected with the construction and working of railways alone; but on further consideration the time has been extended another year, and exhibits connected with has been extended another year, and extincts connected with inland navigation, as forming a component part of the system of communication, will be embraced in the programme. The com-mittee as at present formed consists of Herren Streckert, of the Government Railway Department, as President; and of the Herren Simon, President of the Berlin-Hamburg Railway Company; Schrader, Director of the Berlin-Anhalt Railway Company; Schwartzkopff, chief of Berlin Locomotive and Engine Works; Richter, M.P., General Director of the Königs and Laurahuette Ironworks; and Glaser the proprietor of *Glasers Annalen*, &c. The spot chosen for the exhibition is the Lehrter railway station, which is to be abandoned on the completion of the States railway

-this with the sidings comprises an area of 500,000 square metres, or nearly three times as large as the space occupied by the Düsseldorf exhibition last year. The programme comprises :---(1) The method of construction, including sleepers, rail fasten- (1) The method of construction, including sleepers, rail faster-ings, turntables, points, switches, crossings &c.; (2) signals, with the electric and other apparatus used in working them; (4) rolling stock, such as engines, carriages, &c.; (4), cranes, hoisting machinery, &c.; (5) arrangements and method of control of and in stations, workshops, &c.; (6) instruments and tools for measuring, testing, &c.; (7) method of working railways, &c.; (8) railway literature. Extraordinary methods of working rail-ways will form a special class, and trials and tests must be made with them on the ground. Invitations to foreign countries will ways will form a special class, and trials and tests must be made with them on the ground. Invitations to foreign countries will be issued early this year, through the several foreign offices, by the Prussian Government, to participate in the exhibition. The above information is ex-official, and of course subject to final revision, but the principal items may be accepted as correct, and indicative of the intentions of the committee.

HARTLEPOOL BREAKWATER WORKS.

THE annual report of Mr. Wm. Belk, the resident engineer to the Hartlepool Port and Harbour Commissioners, furnishes some instructive facts. It appears that during the past year the Breakwater Works have been extended only 27 lineal feet above high-water mark, and 9ft. of foundation. The slow rate of progress is partly due to the fact that in the year there had been only 170 days in which it was possible to work, owing to the weather. The cost of the work in the year, including salaries, the mention of an attain and a cost of mattering has a factor of the state of the part of the state of weather. The cost of the work in the year, including subares, due erection of sea-staging, the cost of material, &c., was £3336, or £1:570 per square yard. The foundation work was set in a depth of 22ft. from low-water mark. Over 451ft. of the pier or break-water works are now completed, at a cost of about £49,300, and there remains to complete the work 148ft, at a cost of £18,000. It is worth adding that in the year 123,370 tons of material have heard dradered by the dredgers of the commissioners—the lowest It is worth adding that in the year 123,370 tons of innaterial have been dredged by the dredgers of the commissioners—the lowest quantity in any.year since 1870—at a cost of £2048, or close upon fourpence per ton, the highest comparative cost in the decade, with the exception of one year. It is evident from the statements made that the port is already deriving in part the advantages that are possible from the large docks opened, and described at the time of opening in THE ENGINEER. In the past year it appears that the merchandise imported increased about 20,000 tons, the grain 40,000 quarters, the timber 125,000 loads, and general goods, and cattle and sheep, in large proportions. The 20,000 tons, the grain 40,000 quarters, the timber 122,000 tons, and general goods, and cattle and sheep, in large proportions. The port now offers the facilities of 114ft. depth of water atlow-water of spring tides; it has 63 acress of docks; timber ponds of over 50 acres; timber yards of 150 acres, and warehouses storing 110,000 quarters of grain, shortly to be increased. It is evident that these facilities, now fully brought into use, should give to the port a large accretion of trade, and cause the revenue of the Port and a large accretion of trade, and cause the revenue of the Port and Harbour Commission to rise rapidly, so as to enable it to advance with its present breakwater works and to undertake others that will add to the safety of the port and to its value to the owners of large vessels. The dredging works of the Port and Harbour Commission are likely to increase the depth of water. A protecting arm has been thrown out to the north of the port, and with its completion, and the carrying out of that now contemplated to the south, it must be considered that the works would have largely contributed to its safety and utility.

LITERATURE.

Electrotyping : A Practical Manual forming a New and Systematic Guideto the Reproduction and Multiplication of Printing Surfaces and Works of Art by the Electro-deposition of Metals. By J. W. URQUHART, C.E. London : Crosby Lockwood and Co. 1880. THERE never was a book written, we suppose, which has not merits, but in many cases the good things are to be found only after a microscopical search. In justice to the public we are reluctantly compelled to say that this volume is one of the most flagrant cases of bookmaking which has ever come under our notice. Reasoning upon internal evidence we should conclude that the critics in considering Mr. Urquhart's book on electroplating, anxious as they always are to give a helping hand to a new author, ignored too much its faults and referred only to its good features. Since the book on plating was issued the author has published two more—one on the electric light, edited by Mr. F. C. Webb, an electrician of great experience, the other is the one now before us. The work on the electric light was far inferior to that on electroplating, and this one on electrotyping is still worse. The first ninety-eight pages, that is, almost half the book, are without an original idea, and do not even present old facts from a new standpoint. The author deals in generalities when the reader and student require specialities, and he appears to simplify while in reality he hides his subject in a mass of verbiage so utterly inconsistent with mathematical and scientific thought, that one is tired of trying to understand scope, plan, or method before the subject is commenced. Let the book, however, give specimens of matter and style. In the chapter on "Source of Electricity," we have much similar to the following :-

"Maxim's machine is made in New York; it is in some respects similar to Siemens' machine.

"Weston's machine is well adapted for the deposition of copper, but it cannot be said to be so economical of power as the improved Gramme and Siemens' machines. The cost of a medium-sized machine is $\pounds 60$. It absorbs about $2\frac{1}{2}$ -horse power. The French agents are A. W.

Kepling and Co., 55, Boulevard, St. Martin, Paris. . . "Siemens' machine—Siemens' Bros., 12, Queen Anne's-gate, London. S.W.—is well adapted to all purposes. A small size is sold at $\pounds 60$. In size and weight it is similar to Gramme's small machine. The power required is the

same. "Much information of a technical character, which cannot conveniently be embodied here, and relating to all kinds of machines, will be found at pp. 33-164 of the author's treatise on 'Electric Light.'"

We do not pretend to be infallible; but the idea of putting such rubbish in a work of this kind would never enter the head of a writer who knew much of his subject. Pages of matter, to fill up the book, whether appropriate or not never being considered, seems to liave been the sole end and aim of Mr. Urquhart. We would undertake to put all that is worth reading in his first 100 pages into the compass of a dozen. The latter portion of the book is more interesting from a technical point of view, inasmuch

as it really does say something of electrotyping. We wish we could look upon this as "linked sweetness long drawn out," but though we have length, we certainly have no sweetness. After an example or two of uncertainty, we sweetness. After an example or two of uncertainty, we will, as in justice bound, quote some of the better part of the work. In writing of "slings and hook," he says they "may be gilt." Why not say definitely which is the better plan. Then, again, what advantage does the work-man get from "Stearine: This is a beautifully white substance, which is used in moulding by itself, and in combination with other materials. It is prepared by saponifying tallow with milk of lime. Stearite of lime is thus produced, which is decomposed by sulphuric acid; the result is sulphate of lime and pure stearic acid." We the result is sulphate of lime and pure stearic acid." ask on behalf of the reader-Is "stearic acid" the same substance as "Stearine?" If so, Mr. Urquhart does not show it. Will anyone undertake to prepare stearine from the above statement? If it was not intended to aid in the preparation of the substance, why was the paragraph given ?

We have said no book is utterly without merit, and in the case of Mr. Urquhart's production the merit will be found in the few working hints given, such as "For dynamo-electric machine working the vat should always be deeper than for battery work. This will prove all the more necessary when a circulator of the solution is em-ployed. One foot extra is usually enough. In deciding more necessary when a circulator of the solution is em-ployed. One foot extra is usually enough. In deciding upon a depositing vat, it should always be remembered that a large bulk of solution works in every way more satisfactorily than a small bulk. It gives a more uniform deposit in less time; the component parts of the whole are not so easily disturbed by accidents; it dissolves the anodes more regularly than a small bulk of solution, and is in every way hoter adouted for world and good is in every way better adapted for rapid and good

working." Mr. Urquhart's book is divided into ten chapters, two or Mr. Urquhart's book is divided into ten chapters, although three of which may be read with a little interest, although no new light has been thrown upon the subject, nor is it presented in the best form. Chapter V. deals with "Depositing and Moulding Apparatus;" Chapter VIII. with the depositing process parts of both these chapters with the depositing process, parts of both these chapters presenting readable and useful matter.

The literature of electrotyping is not very extensive, because the subject is in fact but a minor part of electrometallurgy, and demands no more than one or two short chapters at the most in a work on electroplating. Doubt-less, however, the *cacoethes scribendi* of the author is so paramount that we shall be driven to desperation by a succession of works on electro-gilding, electro-nickeling, &c., each as pretentious and unsatisfactory as this one.

Electrotyping is not an old art. Its discovery was first announced by Prof. Daniell, of King's College, who observed that copper deposited on a plate of platinum produced a coherent sheet, in which the irregularities of the platinum were clearly shown. Messrs, Spencer and Jordan in Eng-land, and Prof. Jacobi in St. Petersburg, developed the observation, and made public the operation in 1839. From then till now progress has been gradual, but we venture to assert that Messrs, Elkington do not follow the systems described by Mr. Unrubed, and that the form of Mr. Grad described by Mr. Urquhart, and that the fame of Mr. Gore will suffer no diminution by the comparison of his work with that before us.

LIVERPOOL ENGINEERING SOCIETY. — The usual fortnightly meeting of this society was held on Wednesday evening, at the Royal Institution, Colquitt-street, Mr. A. Holt, M.I.C.E., in the chair. A paper was read by Mr. J. F. Aspinall, "on Automatic and Non-Automatic Vacuum Brakes." The author first described the working of the Smith Vacuum brake on the Great Southern and Western Railway of Ireland, pointing out some of the improve-ments which had been made in the working parts since its first introduction from America, these improvements having been suggested by the many practical men in whose hands the working of the brake has been placed on our railways. Smith sacks fitted to carriages for over four years were found to be in good order, and apparently capable of lasting a much longer period. Great stress was laid by the author on the necessity of applying the brakes as gradually and lightly as possible, so as not to incon-venience the passengers. The steam valve on the engine is easily adjusted to produce a vacuum of 5in., which is quite sufficient for vacuum brake which he had patented, and which is in use on the London and South-Western Railway, and other lines in England. After describing its working by means of diagrams, and pointing on tits extreme simplicity, on account of the absence of springs and any parts requiring lubrication, the author made some observations as to the gear for applying the brake-blocks to the wheels. The system of placing them between the driving wheels of the loco-motive had not been found to work well, on account of the jarsing motion produced, and it had a bad effect on the coupling-rods. A tensional gear, giving a uniform pressure upon each wheel, was sto the author for his interesting paper closed the proceedings. LINDON AND SUBURBAN RAILWAY OFFICIALS' ASSOCIATION.—

stated to be the best for use on carriages. A hearty vote of thanks to the author for his interesting paper closed the proceedings. LONDON AND SUBURBAN RAILWAY OFFICIALS' ASSOCIATION.— The annual dinner of the members and friends of this association took place at the Criterion, on Saturday evening. It was very much more numerously attended than in previous years, and almost entirely by railway men. For some time the association consisted chiefly of officials of the South-Western Railway, but very many members have now joined from other railways, and the occasional evening meetings for the discussion of papers on railway or allied subjects seem to be very much appreciated. Mr. F. J. Macaulay, secretary of the London and South-Western Railway Company, was in the chair, as president of the association, and the vice-president, Mr. W. Kirtley, locomotive superintendent of the London, Chatham, and Dover Railway, was vice-chairman. In proposing the toast of the evening, the chairman said the associa-tion was established in 1873 by a small number of gentlemen con-nected with the London and South-Western Railway, for three objects—namely, for gathering railway officials together for social intercourse, for mutual instruction by papers, &c., and the inter-change of opinions on railway matters, and for a provident object, in no way interfering with friendly and benevolent societies, but for benefit of members, and now there were 101 members, besides a very large number of subscribing honorary members, and a balance of £1375. The toast was acknowledged by the past president, Mr. Tomlinson, superintendent engineer of the Metropolitan Railway. Sir J. Bennett proposed "The Railway Service generally," and said that if 2500 years ago the Greeks, who knew something of the world would by this time have been worth living in. Mr. W. Adams, superintendent of the locomotive and carriage department of the London and South-Western Railway, responded to the toast. The subscriptions to the association during the evening amounted to n nearly £140.

THE IRON, COAL, AND GENERAL TRADES OF BIRMINGHAM, WOLVERHAMPTON, AND OTHER DISTRICTS.

(From our own Correspondent.)

(From our own Correspondent.) THE mills and forges of South Staffordshire are in much less active employment this week than at any time for three or four months past. Orders to supply the place of those run out are difficult to get; and the firms who before Christmas declined to book beyond January have very little to do. The mails this week from Australia and the Cape have brought some good sheet orders for prompt execution, and they have been distributed over several firms to secure early delivery. A weakened antipodean market has made it difficult to secure late rates for medium sheets; yet good qualities of singles were hard to buy to-day—Thursday—in Birmingham, and yesterday at Wolverhampton, at under £8 when singles alone were ordered, or at much under £7 5s. to £7 10s. when singles were taken in conjunction with doubles and latens. For doubles, £8 10s. was quoted; and latens were easy to buy at £10. Less money than this will be accepted by some firms; but rather than book at the rates offered by customers who have purchased from these houses, there were other sheet makers yesterday, who preferred the alternative of mills sheet makers yesterday, who preferred the alternative of mills

sheet makers yesterday, who preferred the alternative of mills without an order. Best bars held their own at from £7 10s. to £8 2s. 6d.; but medium and common bars were easier than lately. A serviceable bar was offered in Wolverhampton at under £5 17s. 6d. delivered, though the delivery was equal to 3s. 6d. per ton. Other makers declined to book at under £6 to £6 10s. per ton for ordinary merchant sizes.

chant sizes. Most new business is being done in baling strip for the United States. Orders for lots of 500 tons are fairly numerous. One firm having extensive hoop rolling appliances has orders for about 3000 tons of strip for America on its books; but in other departments there is at the same works conspicuous slackness. Makers believe that if they can continue to take the prices which now rule, cotton hoop orders will increase. Some makers quote £6 5s. for this article at works. Tube strip, on the contrary, was offered at £6, and might for some brands of gas strip have been bought for £5 17s. 6d. per ton. Nail strip orders were much sought after. Coopers' hoops were quiet at from £6 10s. to £7. Nail rods are in a little better request for the East, but for home use are very slowly demanded. Rounds for river chains and for cables are moving, and bars for axles of Cape wagons, together with smithy bars of the sort taken by the railway wagon and the rolling stock firms, increase in request. Naw inquiries are out this work for generating and for

axles of Cape wagons, together with smithy bars of the sort taken by the railway wagon and the rolling stock firms, increase in request. New inquiries are out this week for gasometer sheets and for girder plates, with angle and T-bars for bridges and roofs. Staffordshire and Shropshire all-mine pig iron was firm to-day and yesterday at \pounds 3 2s. 6d. to \pounds 3 5s. per ton, and cold blast at from 15s. to 20s. in advance of the last figure. Thorncliffe pigs, for which \pounds 3 2s. 6d. to \pounds 3 5s. per ton, and cold blast at in some cases have been bought to-day at \pounds 3; but the price was too high for business. Good Derbyshire iron could rarely be procured at more than 1s. under \pounds 2 10s. per ton, and in no case with deli-veries extending into July. Northamptonshire and Lincolnshire pigs, which in advance of last quarter-day were put up upon pre-vious sales to the extent of 5s. per ton, were to be had yesterday at a drop of 2s. 6d.; but where only 2s. 6d. had been put on that advance had been maintained, yet without sales. Low qualities of melting iron from Staffordshire furnaces were procurable at \pounds 2 2s. 6d., and cinder pigs at \pounds 2. Engineers are doing an encouraging business in corrugating and bending machinery for the galvanisers. This week an inquiry is to hand for sheet-bending apparatus from the East Indian Peninsula Railway Company. It is to be set up in Bombay, but previous to ship-ment is to be put in operation at the manufacturer's works and passed by an inspector on behalf of the company. When it is mentioned that the price charged by the galvanisers for bending corrugated sheets to shape is about \pounds 2 a ton, it will be readily seen that there is plenty of room for the employment of bending machinery by foreign railway companies to do their own work of this class. A slight improvement is to be noted in the demand for platform weighing machines and tables of the heavier descriptions adapted

this class. A slight improvement is to be noted in the demand for platform weighing machines and tables of the heavier descriptions adapted to railway and dock requirements. American competition in plat-form machines has been successfully met by the introduction by Birmingham makers of machines of superior strength and com-pactness and less cost. Anvils are in steady demand by the United States.

pactness and less cost. Anvils are in steady demand by the United States. The leading makers of patent wrought nails have this week advised customers of a reduction in prices of 2½ per cent. on the gross ; but smaller makers have not as yet followed suit. The operative ironworkers of South Staffordshire, North Staf-fordshire, and Shropshire, have now formally signified themselves as in favour of adopting the principle of insurance in lieu of the benefits of the Employers' Liability Act. The South Staffordshire Mill and Forge Wages Board have now, therefore, appointed a committee of masters and men to arrange a scheme, and more particularly the proportion in which the employers and employed shall respectively contribute. At present the masters hold that their liability will be more than met by the payment of 25 per cent. on the men's contributions to the fund; but this amount the men say is insufficient. The report of the Patent Nut and Bolt Company, Darlaston, of which I forwarded a summary in my last, was adopted at the annual meeting of the company on Tuesday in Birmingham. Mr. J. D. Weston, the chairman, said that a profit of £36;500 had been made in the face of very severe competition. That success was not due to any temporary causes, and it gave promise of long continuance. Although the directors had not for the last six or seven years added anything to capital account, they had extended and partly rebuilt their works; increased, renewed, and re-modelled their machinery; and almost re-modelled also the colliery of which they came into possession seven or eight years ago. They had made their blast furnaces second to none in Glamorganshire, or indeed in Wales, and they had laid down railways and introduced their machinery; and almost re-modelled also the colliery of which they came into possession seven or eight years ago. They had made their blast furnaces second to none in Glamorganshire, or indeed in Wales, and they had laid down railways and introduced appliances that would serve the purpose of production combined with economy. The iron that they made at two large ironworks they manipulated mainly into nuts and bolts, and railway fasten-ings generally. The deputy-chairman—S. de la Grange Williams —in seconding a motion declaring a dividend of 10 per cent., said that the profits of the company had been made in spite of prices lower than had ever before been known in the trade. This was done, he said, by the company at their works, and he added that "the company was almost in a position to make nuts and bolts for nothing." nothing.

"The company was almost in a position to make nuts and boits for nothing." During the week the annual meeting of the South Staffordshire and East Worcestershire Institute of Mining Engineers has been held at Dudley. The report showed 241 members, as against 254 last year. Mr. Thomas Brettell, Dudley, was elected president, and Mr. W. Farnworth, manager of the Swindon Ironworks of Messrs. E. P. and W. Baldwin, vice-president for the year. Mr. George Jones read a paper "On Netherton Anticlinal," and Mr. W. P. Hayward, the retiring president, read one "On Employers' Liability." The new president, in his inaugural address, con-demned the Employers' Liability Bill, and congratulated the insti-tute on the election to the vice-chair of a mechanical engineer. The last half-yearly report of the Wolverhampton Gas Com-pany shows a profit of £6333. The usual dividends at the rate of 10 and 6 per cent. on the consolidated stock and preference shares were declared at the shareholders meeting. The chairman said that the company's gas was sold almost as low as any gas in the kingdom, yet that when the affairs of the company would permit it, a further reduction in the price would be made. The awards made in connection with the Wolverhampton Town Improvement Scheme by Sir Henry Hunt, C.B., the arbitrator

Improvement Scheme by Sir Henry Hunt, C.B., the arbitrator under the Artisans' Dwellings' Act, have recently been appealed

against in seven instances, mostly by the Corporation of Wolver-hampton. The verdicts were given by a special county jury. Upon the seven properties the Corporation gained by the final awards of the arbitrator £2120, as compared with his provisional award; and by the appeals to the jury a further £3222 on the finals—a reduction altogether of £5350 on the total sum of £35,090 awarded unvarianally. awarded provisionally.

NOTES FROM LANCASHIRE. (From our own Correspondent.)

(From our own Correspondent.) Manchester.—A general absence of demand is still the prevailing feature in the iron trade of this district, and even where sellers are prepared with concessions it is difficult to get any offers from buyers. Actual requirements, as I have pointed out in previous reports, are still for the most part well covered, large consumers in many cases being fully bought for the first half of the year, and the stoppage of many of the ironworks, as the result of the miners' strike, has, by diminishing the consumption, tended to still further postpone the placing out of further orders. There was very little doing at the Manchester weekly meeting on Tuesday. The inquiry for pig iron especially was extremely small, and the continued downward tendency in prices which was apparent served only as a check upon buyers in giving out what few orders they might have in hand. Makers, as a rule, who have still a good deal of iron to deliver on account of old contracts, are not actually pressing sales to any large extent, but merchants appear to be forcing the market, and outside brands in dealers' hands are offered at under makers' quotations. Lancashire pig iron is at present meeting with little or no

Lancashire pig iron is at present meeting with little or no demand, and the local furnaces are only kept going with deliveries on account of contracts in hand. The quoted prices for delivery into the Manchester district remain at 46s. 6d. for No. 4 forge and 47s. 6d. for No. 3 foundry, less $2\frac{1}{2}$ per cent., but these figures are scarcely more than nominal, and makers would be open to offers at 6d to 1s, per top less

scarcely more than nominal, and makers would be open to offers at 6d. to 1s. per ton less. Lincolnshire and Derbyshire irons are now being offered in this district at very low figures ranging from 46s. to 48s. per ton, less $2\frac{1}{2}$ per cent., for forge and foundry qualities delivered equal to Manchester, although some makers are asking considerably above these prices. Middlesbrough iron could also be bought at 46s. 10d. per ton, net cash, delivered equal to Manchester, but at this price there is no business to be done here.

In the finished iron trade makers are firm at late rates, but there is no general activity in the demand to give any real strength to the market. The position taken up by manufacturers is due almost solely to the exceptional cir-cumstances created by the colliers' strike, which has temporarily entailed a considerable increase in the cost of coal, and also a serious interruption with operations at many of the works. For hoops and sheets a tolerable good enquiry is reported both on home and export accounts, and there is also a moderate business doing in light rails, but other descriptions of finished iron are only in limited request. For delivery into the Manchester district the average price for ordinary bars remains at about £6 per ton, ordinary baling hoops are quoted at £6 10s. to £6 15s., and steel hoops, of which a considerable quantity are now being used, £8 15s. to £9 per ton; sheets are quoted at £7 15s. to £8; ordinary boiler plates at £7 15s. to £8 5s.; and good marked brands at £9 to £9 10s. per ton. In the finished iron trade makers are firm at late rates, per ton.

In the engineering branches of trade there is no material change. General engineers complain that very few new orders are coming in, whilst the recent severe weather, by delaying building opera-tions, has interfered with the execution of orders in the hands of machinist. machinists.

tions, has interfered with the execution of orders in the hands of machinists. There are at length indications that the protracted strike in the Lancashire coal trade is coming to an end. In the West Lancashire districts a fair start towards a resumption of work has been made this week. The men, however, are still in a very unsettled state, and the number at work has fluctuated from day to day; but the general impression is that the close of the week will see a virtual termination of the strike. In the Manchester district, the number of men going in has been slowly increasing during the week; but the proportion of men at work is still very small. In other dis-tricts, where work had last week been partially or wholly resumed, the position of affairs remains without material change. So far as round coals are concerned, buyers and consumers in Lancashire have continued to receive plentiful supplies from outside districts; but engine classes of fuel are still scarce, and this has been a serious inconvenience in many branches of industry. Exceptional prices, governed by the present condition of the market, have still to be paid for supplies, round coal delivered into the Manchester district ranging about 14s. to 16s. 6d., and good qualities of engine fuel, 10s. 6d. to 12s. 6d. per ton; but the anticipations of an early ter-mination of the strike have during the last few days had a material effect upon the market. Buyers, in the expectation of lower prices, have been holding backfurther orders for any large quantities. Holders of stocks have shown an anxiety to press sales, and sellers from out-side districts have evinced a disposition to give way upon their late rates. Although the absence of stocks, which have been so com-pletely cleared away during the strike, will have a tendency to strengthen the market, there is every indication that as soon as the Lancashire output of coal is once more fairly resumed, prices will return to a level comparatively little above that ruling prior to the strike, and it will be c

manufacturing purposes that any intertain terms in problem be maintained. During the week the directors' reports of several large Lancashire coal and iron companies have appeared, and they fully bear out what I have written. The half-yearly report of the Wigan Coal and Iron Company, the largest concern of its kind in Lancashire, shows that the net result of the com-pany's operations for the six months ending December 31st last was a profit of £419, and the directors state that the working of the collieries during the half-year showed an actual loss, the selling prices of fuel having fallen below the cost of production. The manufactur and sale of pig iron had, however, proved fairly satis-factory. The directors, in concluding their report, express their re-gret at the unprofitable state of the coal trade, and add that the year just closed has been by far the most unsatisfactory as regards the coal trade which has been experienced since the company was formed. In the half-yearly report of the Astley and Tyldesley (Coal and Salt Company a loss of £1889 upon the six months is shown, which will increase the amount standing to debt of profit and loss and account in this company to £5900. *Barrow.*—The demand for hematite pig iron has improved on the

and loss and account in this company to £5900. Barrow.—The demand for hematite pig iron has improved on the week, and it is now evident that as the spring season advances the demand will considerably improve. At several of the works in the district the number of furnaces in blast is likely to be increased as the demands made upon makers of iron will be greatly supplemented when the spring season commences. This week the value of iron is quoted at 70s. per ton for Nos. 1, 2, and 3 Bessemer, 68s. for No. 3 forge and foundry iron, and 65s. for inferior qualities. An advance of 10s. per ton has been made on steel rails. Iron ore remains in good demand at from 12s. 6d. to 16s. 6d. at pits. There is a liberal delivery of ore from Spain and other countries. Shipbuilders and engineers are very busy, although no new orders of magnitude have recently been booked. On Saturday the Barrow Shipbuilding Company launched a

have recently been booked. On Saturday the Barrow Shipbuilding Company launched a powerful dredger, for the European commissioners, intended for dredging operations at Sulina. She is of the following dimensions: Length, 124ft.; breadth, 38ft.; and depth of hold, 10ft. She is of exactly similar dimensions to the two dredgers built by the same company for the St. Petersburgh Canal. Storage arrangements are being made in the Barrow docks for iron and steel, with a view of facilitating the shipment of metal by means of warrants.

means of warrants.

THE SHEFFIELD DISTRICT. (From our own Correspondent.)

(From our own Correspondent.) THE sliding scale arrangement for the regulation of miners' wages makes progress. I have already informed you that an arrangement was come to at Manvers Main, for a period of two years. This week the Holmes Colliery has also been put on the same principle; and by the end of the week—or at all events by the end of next week—Denaby Main will be arranged in a similar way. With Denaby Main over 3000 colliers will then be working under the sliding scale; and there are hopes that the proposals of the masters to have it general in the district may yet be agreed to. Mr. Frith representing the Barnsley Union, opposes the sliding scale unless it is preceded by 10 per cent. advance, which the coalowners state they cannot afford. Mr. Chappell, of Swinton, who represents a not inconsiderable section of the mines in the Rotherham district, is doing his utmost to induce his men to accept the employers' pro-

unless it is preceded by 10 per cent. advance, which the coalewners state they cannot afford. Mr. Chappell, of Swinton, who represents a not inconsiderable section of the mines in the Rotherham district, sedoing his utmost to induce his men to accept the employers' pro-posals, and is incurring a good deal of obloquy from his order on that account. But he is making way amongst his men, and there is now more hope of ending strikes by a sensible arrangement like that of the sliding scale than at any previous period. Strong confirmation of the coalowners' statement that coal-working is far from profitable, is found in the report of the Rotherham, Masborough, and Holmes Coal Company, Limited, which reached me last Monday. The loss on the year's working is \$4530. The directors state that it is not possible to carry on the company without more capital, and that the time has now arrived to re-organise the company. Mr. Charles Markham, the managing director of the Staveley Coal and Iron Company, in a very sensible letter to the *Skefield Daily Telegraph*, points out that there is hardly a colliery in South Yorkshire and North Derbyshire that has for a long time past been worked at a profit, and that every thousand pounds that has been received from the sale of coals has been expended in material, wages, and tolls to railway companies. He adds — and no one knows better than he does—that the iron trade is in a very unsatisfactory con-dition, and a very slight increase in the value of coal will inevitably lead to the blowing-out of a number of furnaces. As a matter of fact this was done by Messrs. John Brown and Co., Limited, when their colliers at Aldwarke Main and Carr House struck for a 10 per cent. Advance. The Carr House men have now requested to be taken back on the old terms against which they struck, and have accompanied their request by an expression of regret that they should have caused the pit to stop. The Midland Iron Company announces a profit for the year end-ing 31st December last of £4884, making with

The directors of Messrs. Samuel Fox and Co., Limited, Stocks-bridge Works, Deepcar, have declared an interim dividend of £4 per share, for the last half year, being at the rate of 10 per cent. per annum.

THE NORTH OF ENGLAND. (From our own Correspondent.)

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the increase during the week is 3838 tons, making a present total of 144,283 tons. The manufactured iron trade maintains its previous position, plates being quoted at £6 15s., angles £5 15s., and bars £5 10s., in trucks Middlesbrough less 2½ per cent. discount. The scarity of specifications previously complained of is not now quite so great, and two or three weeks of fine weather would probably cause it to disappear altogether. The principal source of anxiety to the manufacturers is the attitude of the ironworkers. The concession made last week at the Stockton Works to shearmen's helpers, has had the effect of unsettling every other class of labour. The Board of Arbitration and sliding scale are simply laughed at. The men argue if masters are found ready to relin-quish their claims under these contracts, whenever pressed by a dozen men in each works, they must expect to be successively pressed by each dozen employed by them. It is reported that most of the men employed by the Stockton Malleable Iron Com-pany put in their notices on Saturday last for as yet undefined advances. The Standing Committee of the Board of Arbitration has been hastily called together to consider the situation, but no decision has been arrived at. It is thought by many that a lock-

out or strike of at least a week's duration is likely to take place

out or strike of at least a week's duration is likely to take place before long. This will not injure the interests of the employers much if at all. It will allow the shipbuilders to overtake the stocks in their yards, and will tend to depress both the labour and the pig iron markets. Indeed it would help matters in every way from the manufacturer's point of view. An attempt was made on Tuesday to sell by auction in Middles-brough Exchange the West Hartlepool Rail and Plate Mills. The attendance was very small, not more than a dozen persons being present, and none of whom made a single bid. The upset price was £25,000 for property which originally cost nearly £100,000. The works comprise 140 puddling furnaces, rail mills equal to a turn-out of 40,000 tons, and plate mills capable of producing 10,000 tons per annum. It is clear that at present there is no capitalist in the district who thinks that the investment is a favourable one at the above, if at any, price. The coal trade keeps very quiet at previous prices. At the coal trade offices, Newcastle, a meeting of viewers has been held to consider the case of the Seaham Colliery. The conclusion unani-mously arrived at was that it is not at present safe to interfere with the "stopping" of the sealed up workings; and that the month of June is the carliest date when the question should be re-considered.

considered.

NOTES FROM SCOTLAND. (From our own Correspondent.)

NOTES FROM SCOTLAND. (From our own Correspondent.) THERE has been little animation in the warrant market this week, speculation having for a time been somewhat checked by the failure of a broker, holding a large quantity of iron, last week, and also by the unfavourable nature of the reports to hand con-cerning the condition of the different departments of the trade. Except for home consumption, the demand for pig iron just now is very flat. So far as can be learned the orders for the Continent come in but slowly, and the backward state of the trade in Scottish pigs in New York is unfavourable to the immediate expansion of business in that direction. Last week's shipments amounted to only 7404 tons, as compared with 15,152 in the corresponding week of last year, and the foreign exports show a comparative decrease since Christmas of no less than 20,205 tons. The arrivals of Middlesbrough pigs are increasing, because the stocks that were laid in by merchants here are all but exhausted. Business is, how-ever, quiet. At the malleable works there has been rather more iron wanted, and the placing of a series of fresh contracts in the shipbuilding trade will serve to prolong their activity. The foundries, with a few exceptions, are doing rather less. The steel works continue as busy as they possibly can be. Stocks of pig iron go on increasing, there being about 526,000 tons in store with Messrs. Connal and Co., in Glasgow. During the first six weeks or so for he year, particularly if the weather is bad, heavy storing of pig iron is quite a usual thing, but the increase this season would appear to be considerably above the average. Business was done in the warrant market on Friday forenoon at from 50s. 6d. to 50s. 7d. cash, and 50s. 8d. to 50s. 9d. one month, the afternoon quotations being mostly a shade less. On Monday the market was dull, with prices declining. The forenoon's busi-ness was done at from 50s. 6d. to 50s. 6d. cash, and 50s. 5d. one month, while the figures at the afternoon's market were 50s. 4d. to 5

The inventors, patentees, and manufacturers of Glasgow have agreed to petition Government in favour of Mr. Anderson's Patent Bill. The makers have 121 furnaces in blast against 111 at the same date last year, 113 being employed making ordinary pig, and 8 hematite. Since last report one furnace has been put out at the Monkland Works. The inquiry for makers' iron is dull, and the prices are, as a rule, rather under those of last week. Gartsherrie, free on board, per ton, No. 1, is quoted at 60s.; No. 3, 52s.; Coltness, 60s. 6d. and 52s. 6d.; Langlean, ditto, ditto; Stummerlee, 60s. and 51s. 6d.; Calder, 60s. and 52s. 6d.; Carnore, 57s. 6d. and 51s. 6d.; Clyde, 51s. 6d. and 49s. 6d.; Monkland, 51s. 6d. and 49s.; Govan, ditto, ditto; Stotts, at Leith, 60s. 6d. and 53s. 6d.; Carron, at Grangemouth, 62s. 6d. -specially selected, 56s.—and 51s. 6d.; Kinneil, at Boness, 52s. and 51s. 6d.; Glangarnock, at Ardrossan, 57s. 6d. and 52s. 6d.; Eglinton, 51s. 6d.; Dalmellington, ditto, ditto: The Meditermanean, £1088 to Antwerp, and £8300 worth of machinery, of which £1443 was for Trinidad and £9300 for Calcutta; £27764 sewing machines, of which £4684 went to Melbourne, £1005 to the Meditermanean, £1088 to Antwerp, and £855 to Halifax and Boston; £18,000 worth of other manufactures, of which £4470 went to Melbourne, £1005 to the Meditermanean, £1088 to Antwerp, and £855 to Halifax and Boston; £18,000 worth of other manufactures, of which £3470 went to Melbourne, £730, pipes, for Rio de Janeiro, £2046 for Calcutta, £2080 for Trinidad, and £810 ron Yandi Colville, are at length in operation. They cover 14 acres of ground, and have roots enclosing 5400 square yards. Simens's gas producers, to the number of thirty-two, have been receted, and there are four twelve-ton melting furnaces, capable of making 500 tons of steel ingots weekly. Engines, steam hammers, rolling mills, and shears have been provided upon the most approved principles, and the multa spear to be well equipped in every particular. The steel manufacture in Soctland

and Hydraulic Motor," Mr. Joseph Russell, shipbuilder, Port-Glasgow, was admitted a member, and Messrs. William Ferguson, James Harvey, and S. B. Newton as graduates.

WALES AND ADJOINING COUNTIES. (From our own Correspondent.)

(From our own Correspondent.) It seems that the Swansea Bay and Rhondda Railway is not so popular among the Swansea coalowners as was expected. It is contended by these objectors, who of course are only exceptional, that the Rhondda coal being of superior character to that of Swansea the coal trade of the place must suffer, and only the railway and harbour interest benefit. The protectionists, however, are few in comparison with the free traders, and the new move-ment for linking the great coal valley with Swansea is progressing well. well

Well. General trade at this place is also improving, and much better hopes are entertained of the tin-plate works. Some slight addition to prices has been had within the last few days. Welsh iron is still in fair demand, and at Swansea and Cyfarthfa business in this class is tolerably good. Bars are firm at $\pounds 5$ 5s. There is not so much incoming for eld will and the state of th much inquiry for old rails and scrap, and one good reason for this

is, large stocks which have been accumulated are now generally reduced. I noticed considerable activity at Tredegar Works lately. The furnaces, now of modern form, are doing good work. The inquiry for iron and steel rails continues. Firms near Sheffield and in Cleveland have secured the contracts for rails to the new line at Hull, which were hoped to come in this direction. The Taff Vale are pushing on their new branch up the Clydach, and if anything like good weather be obtained the close of the spring will see a substantial part completed. I note that at the meeting of Taff Vale directors at Bristol this week, the announcement of 10 per cent. dividend and 8 per cent. bonus was declared. The directors also gave away £1000, half to the new hospital at Cardiff, and the other to schools. One of your contemporaries suggested lately that some remis-sion to coalowners would be acceptable. This is not likely as regards the tonnage of coal, but it might fairly be done on pitwood up the line, and, considering that this is an important item to coal-owners, an abatement would be appreciated. That would leave tolls on coal as they are. Shipments of iron have been husy of late to the Brazils and

Shipments of iron have been busy of late to the Brazils and

Supments of iron have been busy of late to the Brazils and Rio de Janeiro, and good orders are on books for these localities. The total exports of iron and steel from the Welsh ports last week were over 5000 tons; total exports of coal, 170,000 tons, showing an increase over the exports of the week before of 67,000 tons. Cardiff alone in the two weeks' exports shows an increase of 60,000 tons. Prices have not advanced, but there is a firm condition noticeable, and business is done freely at 9s. 6d. to 10s. f.o.b., double-screened steam coal. Demands are substantial from the Mediterranean, especially the upper, and the Spanish and Italian ports. A good trade is also

Demands are substantial from the Mediterranean, especially the upper, and the Spanish and Italian ports. A good trade is also done with the East Indies and the River Plate, but French busi-ness, especially northern, remain slack. The colliers are quiet in all districts of South Wales and on the Momouthshire coal-fields, and not a solitary case has occurred of a demand for increased wages, the men abiding steadily by the provisions and arrangements of the sliding scale. It is, however, thoroughly understood that if existing prices are maintained, showing an advance of 1s. from previous rates that they will put forward a plea for an advance. This, of course, will be given without application, if the examination of the books should justify it. justify it.

without application, if the examination of the books should justify it. Steady adherence to the Permanent Fund continues to be shown by neighbouring counties, such as Gloucestershire and Somerset-shire, the colliers in many cases contracting themselves out of the Employers' Liability Act, and in all cases the coalowner has bound himself to give a substantial addition to the fund. There is less inaction amongst certain classes of tin-plate workers, notably forgemen. At Liverpool and London 15s. is about the ruling price for ordinary coke, but as the make is falling in quantity a better figure may be expected in a short time. A working collier suggests that collieries should be cleared of men and horses one day in the month, and the air stopped so that gas should escape in great quantities, then brisk currents put to work, the colliery cleansed thoroughly, and work resumed. At the Mardy colliery a resolution has been passed by the colliers to assist the officials in bringing offenders to justice who smoke in the colliery. This is a step in the right direction. One of the Mardy colliers had been sentenced but a few days before to one month's imprisonment for the offence.

With regard to the alleged defect in the special rules of the Mines Regulation Act respecting carrying pipes in collieries, it is stated that at each colliery owners are drawing up regulations respecting it.

respecting it. An important colliery in the Aberdare Valley is in Chancery. The petition for winding up the Glanyravon Iron and Tin-plate Company has been dismissed with costs. The petitioning creditor has since been paid in full. The new appliances at the Bute Docks for unloading Bilbao ore into Cyfarthfa wagons are working with the greatest success, both mechanically and as to descrete

mechanically and as to despatch.

GAS-LIGHTED BUOYS FOR THE SUEZ CANAL.—M. Ferdinand de Lessejs has not been slow to recognise the value of the gas-lighted buoys made under Pintsch's system, and being extensively adopted by the Corporation of the Trinity Brethren, and by the Board of the Northern Lighthouses. A buoy on Herbert's pattern, the form almost universally employed by the Trinity House, 7ft. diameter and of 150 cubic feet capacity, has been pre-pared by the Pintsch's Lighting Company and fitted with com-pound lens lantern showing a red light, for employment on the port side of the entrance to the Suez Canal, by order of M. de Les-seps. The buoy is of the same form as that illustrated in THE ENGINEER for the 25th of April, 1879, and will be sent out filled with gas at a pressure of 7 atmospheres. The 150 cubic feet at this pressure will burn continuously for six weeks — the 150 cubic feet at that pressure being equal to about 1050 cubic feet of gas at atmospheric pressure. From the high pressure it is reduced by a regulator, already described in our pages, whence it passes to the burner at a pressure equal to that due to a head of about 14in. of water, 07 cubic feet being burned per hour. For the pur-pose of testing it the buoy was sent down to the oil gas-works on the South-Western Railway at Clapham, erected there for the supply of carriages of the company lighted on Pintsch's system. For the supply of gas to the buoys on the Clyde, the Clyde Lighthouses Trust are erecting oil gas works at Port Glasgow, and a bell buoy, fitted with the gas apparatus, is a bout to be added to those on the Clyde. The following letter from the engineers to the Northern Light Board is of interest — "Northern Lighthouses, we recom-mended that Board last year to give their statutory sanction to the establishment of these buoys at Skelmorlie Shoal and Roseneath Patch, by the Clyde Lighthouse Trust. We have also recommended the Northern Light Board to adopt them at different parts of the coast, and also to test the suggestions which we some time ago man the Northern Lights Board to adopt them at different parts of the coast, and also to test the suggestions which we some time ago made—first, of hanging the lantern on gymbals, so as to secure the constant horizontality of the emergent beams of light; and, second, the mode of distinguishing one buoy from another by making the flow of the gas itself, in passing through an automatic meter, to produce characteristic flashes for intermittent or occulting lights, without the use of clockwork.—We are, Sir, your obedient servants, (signed) D. and T. Stevenson.—To William Lester., Esq., 58, Renfield-street, Glasgow." We cannot say what value is to be attached to the second suggestion made by Messrs. Stevenson, but as to the first, it must be remarked that in rivers such an arrange-Renield-street, Glasgow." We cannot say what value is to be attached to the second suggestion made by Messrs. Stevenson, but as to the first, it must be remarked that in rivers such an arrange-ment would never be essential, while it is well known that the Herbert buoys float remarkably level, even in a considerable sea; so that, for river mouths, the gymbal arrangement does not seem necessary, especially when it is remembered that any swing arrangement would greatly complicate the apparatus, and materially detract from the reliable character of the buoy as a light. While at the oil gasworks at Clapham a few days since, we noticed that the one 7in. retort at work was making 4 cubic feet of gas per minute from oil which is sold in this country at £7 per ton. From one gallon of this oil \$7 cubic feet of gas are made, and the Pintsch Company receive ½d. per hour per lamp, which replaces an oil lamp costing §d. at least per hour. This is done by the latter com-pany at a profit, and the railway company saves 20 per cent. of the cost of lighting as compared with oil, while the passengers have the advantage of a vastly superior light. It will probably soon occur to the railway companies generally, that they are neglecting a great source of profit by omitting to use gas, to say nothing of the saving in lamp glasses, labour, and wear and tear. The whole of the South-Eastern Railway Post-office vans are now fitted with gas lighting apparatus, and new vans are to be so fitted both on this line and the South-Western Railway. The light is not only so much better but is so much safer in case of accident.

THE PATENT JOURNAL. Condensed from the Journal of the Commissioners of Patents.

*** It has come to our notice that some applicants of the Patent-office Sales Department, for Patent Specifications, have caused much unnecessary trouble and annoyance both to themselves and to the Patent-office officials by yiving the number of the page of THE ENGINEER at which the Specification they require is referred to, instead of giving the proper number of the Specification. The mistake has been mude by looking at THE ENGINEER Index and giving the numbers there found, which only refer to pages, in place of turning to those pages and and the numbers of the Specification.

Applications for Letters Patent. *** When patents have been "communicated" the name and address of the communicating party are printed in italics.

printed in italies.
15th February, 1881.
634. JACQUARD CARDS, B. TOONE, NOttingham.
635. SECURING TURES in BOLERS, W. Tully, London.
636. PRESERVINO POTATORS, &c., G. L. Laird, Douglas.
637. ROLLING MILLS, P. Kirk, Worthington.
638. BICVCLE, J. H. Palmer, Aston-juxta-Birmingham.
639. CONDUCTORS, W. R. Lake, --(H. Maxim, Brooklym.)
640. LURICATING SPINDLES, H. J. Haddan.--(J. W. Wattles, Massachusetts, U. S.)
641. MOTOR ENGINES, E. M. Strange, Baltimore, U.S.
642. CHILDREN'S COTS, G. W. MOON, London.
643. VELVET TISSUES, A. C. Henderson.--(Martin, Willems, and Co. Lille.)
644. HEATING, &c., G. E. Pritchett, Bishop's Stortford.
645. STEAMINO, &c., CASKS, A. Heathorn, Clapham.
646. CASES, W. E. Gedge.--(K. S. Jennings, Baltimore.):
647. PADLOCKS, T. Harby, Liverpool.
648. SEOURING HANDLES, A. J. & R. F. Drury, Sheffield.
649. GOVERNORS, R. Schmitz-Worotte, London.
650. LOOMS, A. M. Clark.--(C. Coupland and J. H. Timgue, Seymaur, U.S.)
651. SHEEP-SHEARS, A. M. Clark.--(C. Benavides and J. P. Arhur, Laredo, U.S.)
652. FRICTION APPARATUS, J. Walter.--Monteiro Hime and Co., Brath.)
653. STOYES, W. A. G. Schönheyder, Stoke Newington.
654. SOWING SEEDS, & c., J. H. Johnson.-(N. B. Clark, Philadelphia, U.S.)
654. UMBRELLAS, & c., J. Jarman and J. Sambrook, Birmingham.
656. UMBRELAS, & c., J. Jarman and J. Sambrook, Birmingham.
657. VENTHATING MINES, & c., J. Knox, G. Falconer, R. Burns, and A. Knox, Glasgow.
164 February, 1881.
658. MEDICINAL COMPOUND, G. W. Hamilton, London. 15th February, 1881.

16th February, 1881.

16th February, 1881.
16th February, 1881.
1658. MEDICINAL COMPOUND, G. W. Hamilton, London.
160. SIZING MACHINES, E. and S. Tweedale, Accrington.
160. SIZING MACHINES, E. and S. Tweedale, Accrington.
161. SHEEP RACKS, &c., E. Thomas, Oswestry.
162. HANDLES for BATS, O. E. Woodhouse, London.
163. TELEPHONIC APPARATUS, P. M. Justice.-(H. R. Miller, South Framington, U.S.)
164. PANTING, J. C. Mewburn.-(A. Gutmann, Italy.)
165. SECURING RARE TEETH, P. Pierce, Wexford.
166. REMOVING SNOW, &c., W. L. Roberts, Cheltenham.
167. SIGNAL APPARATUS, J. Saxby & J. Farmer, Kilburn.
168. BICYCLES, &c., H. J. Swindley, London.
169. ACTIVICIAL BARK, J. Richardson, London.
170. BOILING, &c., FABRICS, W. Hutchinson, Weasté.
171. VALCEREDES, A. Kirby, Bedford.
172. LOOMS, E. Jackson, Bradford.
174. Brandom.-(H. Piepre, Liege.)
176. ATTOMATIC BRAKE, &c., W. S. Paterson, London.
176. SEULING MACHINES, Z. H. Skraup, Vienna.
177. SEWING MACHINES, Z. H. Skraup, Vienna.
178. OXCHINOLINES, Z. H. Skraup, Vienna.
174. Prebruary, 1881.
174. Pebruary, 1881.
174. Pebruary, 1881.

17th February, 1881.
682. PAPER-CUTTER, S. Wilde and J. Carter, Cheshire.
683. BRIDLE-BIT, E. L. Andersen, Brighton.
684. FANCY YARNS, G. A. J. Schott, Bradford.
685. FASTENING TILES, &c., D. M. Yeomans, London.
686. CUFFS, J. Felsenstein, London.
687. DESSING FLOUR, &c., T. Hind & R. Lund, Preston.
688. JOINT FASTENERS, H. J. Haddan.-(T. H. Alexander and A. H. Nicholson, Washington, U.S.)
689. Pic HRON, J. B. Thorneyeroft, Hurlford.
690. STEAMING FABRICS, J. Parkinson, West Leigh.
691. STEAMING FABRICS, J. Parkinson, West Leigh.
693. Boars or VESSELS, T. Nordenfelt, London.
694. TOOL-HOLDER, W. Timms, West Hartlepool.
695. ENGINES, G. Sellers, Birstall.
696. BRAKE APPARATUS, C. W. Siemens, London, and A. C. Boothby, Kirkcaldy.
697. FLIDE VALVES, P. Brotherhood, London.
698. PEN HOLDERS, M. Benston.-(W. Stewart, Brooklyn.)
690. DIGGING, &c., POTATOES, R. A. Clark, Liverpool.
691. Magnesia, A. M. Clark.-(J. B. M. Closson, Paris.)
18th February, 1881. 17th February, 1881.

18th February, 1881.
702. FLOOR CRAMPS, G. Butler, Chiswick.
708. KNITTING MACHINES, J. H. Smith, Nottlingham.
704. CORKS, F. des Vœux. — (E. Gaston, France.)
705. SUBSTITUTE for PUTTY, F. W. Fletcher, London.
706. KITCHER RANGES, J. H. Jack, Edinburgh.
707. WINDOW BLINDS, R. Brierley, Higher Walton.
708. MOULDING BOTTLES, &c., J. LyON, St. Helens.
709. LAYING PIPES, J. W. Butler and M. Dalc. — (C. A. Berthelet, Milwaukie, U.S.)
710. ORNAMENTING CLOTHS, R. F. & T. Watson, Hawick.
711. DECANTERS, &c., E. J. Collis, Stourbridge.
712. THRASHING MACHINES, A. M. Clark. — (A. L. Budoly, France.) 18th February, 1881.

Eudony, France.) 713. Oli CANS, L. Field, Birmingham. 714. SAWING MACHINES, S. W. Worssam, Chelsea. 715. LAMPS, J. G. Tongue.—(A. Lacomme, Paris.)

19th February, 1881. FIRE-ARMS, T. J. Atkinson & J. Needham, London.
 DOOR FASTENER, J. Woodward, Wolverhampton.
 MAGIC LANTERNS, E. P. Alexander. - (A. L. Lanter, Bardo).

718. MAGIC LANTERNS, E. P. Alexander. - (A. L. Lawerne, Pavis.)
719. EXPLOSIVE GASES, W. Morgan, Pontypridd.
720. NAILS, A. Burton, Leeds.
721. LINING CYLINDERS, E. R. Allfrey, Deptford.
722. ENNESS, E. A. Brydges. - (R. Lehmann, Berlin.)
723. METALS, J. C. Maltby & G. Bradford, Rotherham.
724. BOOTS and SHOES, L. MORTON, LONDON.
725. COVERING ROLLERS, W. J., & C. Haynes, Salford.
726. BINDING VOLUMES, B. J. B. Mills.-(La Société Depoix Lefèvre, Paris.)
727. FLUSHING, & C., APPARATUS, S. H. Adams, Leeds.
728. MAGNESIA, & C., G. G. M. Vernum, Birmingham.
214. Felenaary, 1821

21st February, 1881.
730. TREATING TEXTILE FABRICS, &C., J. Patterson, Belfast, and D. Stewart, Glasgow.
731. RAILS, A. C. Henderson, - (E. W. Sasse, Sweden.)
732. FIRE ANNIHLATOR, W. Walker, sen., Leeds.
733. STEAM, &C., GAUGES, W. R. Oswald, London.
734. FOOT-BALLS, W. E. BUSSEY, Peckham.
735. PREVENTING EXPLOSIONS, J. Tattersall, Manchester.
736. SUGAR, A. Sauvée. - (E. Commerson, Marseilles.)
737. FRUITS, B. J. B. Mills.- (A. J. Magaud, France.)
738. STEEL and Gas, P. Aube, Paris.
739. GROUND MARKER, F. H. Ayres, London.
740. HOLDING, &C., SACKS, S. Wilkerson, Bassingbourn.
741. INK, A. F. Stoddart, Bristol.
742. BRAKE APPARATUS, W. J. Adams, London.
743. STEAM ENGINES, H. H. Lake.- (J. W. Chisholm, Brooklyn, U.S.)
744. DOOR CHAINS, H. Skerrett, Sparkbrook.
745. ENGINES, H. H. Lake.- (J. D. Müller, Wedel.) 21st February, 1881.

Inventions Protected for Six Months on deposit of Complete Specifications.

Inventions Protected for Six Months off deposit of Complete Specifications.
621. VIOLINS, &c., H. J. Haddan, Strand, Westminster. —A communication from E. R. Mollenhauer, New York, U.S.—14th February, 1881.
626. SCISSOR HANDLES, A. J. Boult, High Holborn, London.—A communication from T. Fischer, Solin-gen, Germany.—14th February, 1881.
627. STEAM ENGINES, W. F. Goodwin, Stelton, U.S.— 14th February, 1881.
631. MOTOR ENGINES, E. M. Strange, Baltimore, U.S.) —15th February, 1881.
644. MOTOR ENGINES, E. M. Strange, Baltimore, U.S.) —15th February, 1881.
654. FANCY YARNS, G. A. J. Schott, Bradford.—17th February, 1881.
698. FOUNTAIN PEN-HOLDERS, M. Bonson, Chancery-lane, London. — A communication from W. W. Stewart, Brooklyn, U.S.—7th February, 1881.
Patonts on which the Stamp Duity of

Patents on which the Stamp Duty of £50 has been paid. ESO HAS DEED PARATUS, A. G. Bell, Cannon-street, London.—14th February, 1878.
627. LAMP BURNERS, T. Rowatt, jun., London.—14th February, 1878.
643. SEFARATING VAPOURS, &c., S. Pitt, Sutton.—15th February, 1878.
692. BOILERS, &c., F. W. Webb, Crewe.—20th February, 1878.

643. SEFARATING VAPOURS, &C., S. PIU, SULION.—104 February, 1875.
692. BOILERS, &C., F. W. Webb, Crewe.—20th February, 1878.
712. UMBRELLAS, &C., J. Minière, Bordeaux.—20th February, 1875.
632. STANDS for CHILDREN'S CHAIRS, W. Keen, Scrutton-street, Curtain-road, London.—15th February, 1878.
646. TREATING FATTY, &C., MATTERS, E. Field, Buck-ingham-street, London.—15th February, 1878.
651. SAFETY APPARATUS, F. Leonardt and J. Craig, Birmingham —16th February, 1878.
657. ROLLING METAL, E. H. Waldenström and W. Sumner, Manchester.—16th February, 1878.
809. ROTARY MOTION, J. Barbour, Belfast.—27th February, 1878.
804. PUNCHING OF HOLING SHOES, G. Chancery-lane, London.—15th May, 1878.
805. WILE ROPE, J. Temple, Liverpool.—2nd March, 1878.
804. PUNCHING OF HOLING SHOES, G. Miller, Wickham. —9th March, 1878.
8054. PUNCHING OF HOLING SHOES, G. Miller, Wickham. —9th March, 1878.
8054. PUNCHING OF HOLING SHOES, G. Miller, Wickham. —9th March, 1878.
8055. WILE ROPE, J. Temple, Liverpool.—2nd March, 1878.
8054. PUNCHING OF HOLING SHOES, G. Miller, Wickham. —9th March, 1878.
8055. WILE ROPE, J. CAPS, H. Willington, South Kensington, London.—20th February, 1878.
8054. PUNCHING, &C., APARATUS, W. Parnall, Bristol.— 22nd February, 1878.
8055. WINKI, K., A. Groth, Stockholm.—22nd March, 1879.
8056. MIXING, &C., APARATUS, W. Parnall, Bristol.— 10th February, 1878.
8056. MIXING, &C., APARATUS, W. Parnall, Bristol.— 10th February, 18

756. SPRINGS for PISTONS, W. Buckley, Sheffield.—23ra February, 1878.
699. WooL, &c., E. B. Bright, Delahay-street, West-minster.—20th February, 1878.
717. ELECTRIC LANF, R. A. Kipling, Boulevard de Strasbourg, Paris.—21st February, 1878.
725. MATCHES, E. H. Cameron, Royal Arsenal, Wool-wich.—21st February, 1878.
786. COLOURING MATTERS, J. H. Johnson, Lincoln's-inn-fields, London.—25th February, 1878.
834. CRAFE, P. Le Gros and J. and H. Thompson, Gutter-lane, London.—1st March, 1878.

Patents on which the Stamp Duty of £100 has been paid.

657. ENDLESS OF PORTABLE RAILWAYS, &C., A. Dunlop, Glasgow.—21st February, 1874.
612. PREPARING YARNS, &C., C. C. Connor, Belfast.— 18th February, 1874.
671. WEAVING BAGS, &C., J. Laird, jun., and W. Rutherford, Forfar.—23rd February, 1874.

Notices of Intention to Proceed with Applications. Last day for filing opposition, 11th March, 1881.

4140. PACKING, J. Briggs, Sunderland-12th October,

4140. PACKING, J. Briggs, Sunderland.—12th October, 1880.
4155. STEAM GENERATOR, H. J. Haddan, Strand, Westminster.—A communication from W. von Pittler — 18th October, 1880.
4156. GLOBE-HOLDERS, F. JONES, Birmingham.—18th October, 1880.
4165. CRUSHING, &c., APPARATUS, W. Hartnell, Leeds.—Com, from S. Stonestreet.—18th October, 1880.
4166. DYEING APPARATUS, M. Sella and F. Cerrutj, Hennikerroad, Stratford.—13th October, 1880.
4171. DRAWING FRAMES, W. A. Barlow, St. Paul'schurchyard, London.—A communication from C. Pfeiffer and H. Offroy.—18th October, 1880.
4173. FIRE-LIGHTERS, J. F. Wiles, Finch-Iane, London. — 18th October, 1880.

Churchyard, Löndon. — A Communication Front C. Pfeiffer and H. Offroy. — 13th October, 1880.
4173. FIRE-LIGHTERS, J. F. Wiles, Finch-lane, London. — 13th October, 1880.
4175. BOLT-MAKING MACHINES, S. Gallie, Birkenhead. — 14th October, 1880.
4182. FURNACES, J. Neil, Glasgow. — 14th October, 1880.
4182. FURNACES, J. Neil, Glasgow. — 14th October, 1880.
4187. LOOMS for WEAVING, W. H. Hacking and E. Grupe, Bury. — 15th October, 1880.
4190. STOPPERING BOTTLES, S. Wilkes, Selly Oak, Birmingham. — 15th October, 1880.
4197. SUPLYING LIQUIDS to BOTTLES, A. A. Mondollot, Paris. — 15th October, 1880.
4198. LOOMS for WEAVING, J. Hollingworth, Dobcross, and A. B. Crossley, Halifax. — 15th October, 1880.
4190. OUPLING APPARATUS, C. Kaye, Huddersfield. — 15th October, 1880.
4200. EXPLOSIVE COMPOUNDS, P. M. Justice, Southampton-buildings, London. — A communication from H. Prodhomne. — 15th October, 1880.
4202. FINISHING CASHMERE, J., J. W., and J. Refitt, Leeds. — 15th October, 1880.
4217. CLOTH OILS, J. SWallow, Leeds. — 16th October, 1880.
4225. RUNNERS for UMBRELLAS, A. C. Wright and R. R. Newton, Birmingham. — 16th October, 1880.
4231. SWEEEPING APPARATUS, H. A. Bonneville, Cannon-street, London. — A communication from M. Laporte. — 18th October, 1880.
4245. TREATING ORES, & C. J. C. Stevenson and J. G. Tatters, Westoe. — 18th October, 1880.
4245. REVELORES, E. Hely, Dublin. — 19th October, 1880.
4253. ENVELORES, E. Hely, Dublin. — 19th October, 1880.
4244. PRESSING PAPERES, A. J. Deblon, Lille, France. — 19th October, 1880.
4245. REVELORES, E. Hely, Dublin. — 19th October, 1880.
4245. REVELORES, E. Hely, Dublin. — 19th October, 1880.
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4245. REVELORES, E. Hely, Dublin. — 19th October, 1880.
4

Dec 1880 TUBE FASTENINGS, E. H. Bennett, Bayonne, dson, U.S.—14th December, 1880. WARMING, &C., ROOMS, J. Smith, Liverpool.— December, 1880. TUBE Huds

21st December, 1880. 5418. OBTAINING FIBROUS MATERIALS from a PALM TREE,

R. M. A. Duguid, Liverpool.—A communication from S. S. Herring.—24th December, 1880.
5432. TRICYCLES, J. Harrington, Norman's-buildings, Old-street, London.—24th December, 1880.
5484. PUNPING APPARATUS, E. H. Greeven, Cheapside, London.—Com. from G. Greeven.—30th December, 1880.
5486. BLOCKS of SUGAR, &c., G. Jager, Liverpool.— 30th December, 1880.
344. TREATING GRAIN, &c., A. Gillman and S. Spencer, St. George's-road, London.—26th January, 1881.
365. VERTICAL STEAM BOILERS, W. Lord, Bury.—27th January, 1881.
389. INDLARUBER HOSE, J. Burbridge, R. C. Thorpe and T. Oakley, Tottenham.—28th January, 1881.
457. FURNACES, B. J. B. Mills, Southampton-buildings, London.—Com. from A. Holley.—3rd February, 1881.
Last day for filing opposition, 14th March, 1881.

Last day for filing opposition, 14th March, 1881.

and T. Oakley, Tottenham. -28th January, 1881.
457. FURACES, B. J. B. Mills, Southampton-buildings, London. -Com. from A. Holley. - 3rd February, 1881.
1983. Ansurate, & G., FURNTURE, J. Horton, Copley, Halifax. -1st October, 1880.
4212. COOKING AFFARATUS, St. J. V. Day, Glasgow. --Com. from D. MacAlpin. -16th October, 1880.
4216. TURNING OVER LEAVES of BOOKS, & W. Rigg, Swain-estreet, Bradford. -16th October, 1880.
4226. ROTARY ENGINE, J. S. Chenhall, Castle-street, Bristol. -16th October, 1880.
4236. MARTER VUCANISED FIBER, J. C. Leigh, Moor-side-street, Droylesden. -16th October, 1880.
4237. SWING LOOKING-CLASES, & J. Mackie, Linden-grove, Peckham. -18th October, 1880.
4238. THERENER, P. LAWYENCE, FAITIngdon-road, London. --18th October, 1880.
4237. SWING LOOKING-CLASES, & W. Whitfield and H. W. Atkins, Birmingham. --18th October, 1880.
4248. PHANOTORERS, E. G. Brewer, Chancery-Iane, Lon-don. --Com, from Count V. C. A. P. D. G. Nydpruck and L. A. Beuton. --18th October, 1880.
4248. OBTAINING COPIES of WRITINGS, & C., O. Lelm, Farringdon-street, London. --18th October, 1880.
4261. SCOURING, & C., APPARATUS, J. Petrie, jun, Roch-dale. -19th October, 1880.
4276. SEPARATING APARATUS, E. G. Brewer, Chancery-lane, London. --A communication from T. A. Edison. --20th October, 1880.
4276. NEURING SHIES' CABLES, & C., T. Archer, jun, Dumston Engine Works, & U., T. Reeder, Preston. --20th October, 1880.
4287. BROPPING, & C., MCHINES, C. HARVES, BROMM, M. Jones, Maryhill. -21st October, 1880.
4280. SEOURING SHIES' CABLES, & C., T. Swinburn, Birmingham.-21st October, 1880.
4287. DROPPING, & C., MCHINES, C. HARVES, BROMM, Jones, Maryhill. -21st October, 1880.
4292. PORTLAND CEAVERY, D. S. W. Dawe, Brading, Isle of Wight.-21st October, 1880.
4304. PRINTING MACHINESMY, F. Payne, Otley.-21st October, 1880.
4315. BICYCLES, J. F. R. W 5285. TRICVCLES, J. Steele, Birmingham.—16th December, 1880.
5386. PRACTICAL METEOROLOGY, F. H. F. Engel, Hamburg.—A communication from W. Klinkerfues.— 22nd December, 1880.
5389. EXTRACTING JUICES, A. M. Clark, Chancery-lane, London.—A communication from B. Odio and F. Perozo.—22nd December, 1880.
57. WINDOW FASTENERS, J. Stables, Eldon House, Longsight.—5th January, 1881.
240. PRESERVING ALIMENTARY SUBSTANCES, T. Wilkins, Lavender-road, Surrey.—12th January, 1881.
255. ELECTRIC LAMPS, St. G. L. Fox, Rushmore.—18th January, 1881.
267. ELECTRIC LAMPS, S. C. Homersham, Buckingham-street, London.—27th January, 1881.
27. FIRE-GRATES, J. Britton, Stamford.—28th January, 1881.

387. FIRE-GRATES, J. Britton, Stamford. - 28th January, 1881.
388. ROLLERS, W. R. Schürmann, Düsseldorf. - 28th January, 1881.
407. Looms for WEAVING, J. Kenyon, Blackburn. - 29th January, 1881.
419. CONTINUOUS ROVING &C., FRAMES, G. W. von Nawrooki, Berlin. - Com, from R. Schrike and Messrs. Büldge and Hildebrandt. - 1st February, 1881.
447. CAST IRON PIPES, H. Swift, Stalybridge. - 2nd February, 1881.
676. DOUBLE-BARRELLED GUNS, R. H. Brandon, Rue Laffitte, Paris. - A communication from H. Pieper. - 16th February, 1881.
684. FANCY YARNS, G. A. J. Schott, Bradford. - 17th February, 1881.

Patents Sealed.

Patents Sealed.
(List of Letters Patent which passed the Great Scal on the 18th February, 1881.)
2834. MASKS, W. G. Forster, Polham Villa, Streatham Common, and J. Leighton, Ormonde-terrace, Regent's Park, London.—Oth June, 1880.
3863. BUNNERS, F. H. F. Engel, Hamburg.—19th August, 1880.
3870. STEAM ENGINES, D. Joy, Anerly Park, Anerly.— 20th August, 1880.
3855. SIZING, &C., MACHINES, T. W. Little and W. Townend, Leeds.—20th August, 1880.
3898. MOTIVE POWER ENGINES, F. H. F. Engel, Ham-burg.—21st August, 1880.
3446. SCRIBELING, &C., ENGINES, H. Marsden, Provi-dence Mills, Huddersfield.—25th August, 1880.
3453. WINGING WARPS, J. CONDOR, Blackburn, and J. Robertshaw, Manchester.—26th August, 1880.
3464. CENTIGRADE PHOTOMETER, D. Coglievina, Yinna—25th August, 1880. 3464. CENTIGRADE PHOTOMETER, D. Coglievina, Vienna'-25th August, 1880.
3507. BOBBINS, &c., T. Pearson and J. Taylor, Bolton. --30th August, 1880.
3515. LUBRICATING APPARATUS, W. R. Lake, South-ampton-buildings, London.--30th August, 1880.
3516. PUNCHING, &c., MACHINES, F. Deering and J. D. Morrison, Gateshead.--30th August, 1880.
3517. VEHICLES for ROADS, &c. H. Ciotti, Gordon-Kensington.--30th August, 1880.
3531. WINDOWS, &c., H. Brittain, Birmingham.--31st August, 1880.
3532. CIGARETTES, G. F. Redfern, South-street, Fins-bury, London.---31st August, 1880. bury, London.—31st August, 1880. 3541. FASTENING SACKS, &C., D. A. B. Murray, jun., Glasgow.—1st September, 1880. 3542. DRVING GRAIN, W. Davidson, Mintlaw, N.B.— 2542. DRVING GRAIN, W. Davidson, Mintlaw, N.B.— 1st September, 1880.
2591. BOXES, & G., of ANLES, J. LORES, C. VERION, E. Holden, and R. Bennett, Sandwell Irouworks, Smethwick.—3rd September, 1880.
2619. MEASURING ANGLES, J. F. Armistead, Cobwall HOUSE, Blackburn.—6th September, 1880.
2925. TESTING LIGHTNING CONDUCTORS, S. Vyle, Borough-road, Middlesbrough.—28th September, 1880.
4492. Swirch-BOXES, R. C. Rapier, Westminster-cham-bers, London.—3rd November, 1880. Feb. 25, 1881.

4841. DRVING STARCH, B. J. B. Mills, Southampton-buildings, London.—22nd November, 1880.
5092. MACNETO-FLECTRIC SPEAKING TELEPHONY, H. J. Haddan, Strand, London.—7th December, 1880.
5167. STEEL, T. Hampton, Sheffield.—10th December, 1880. (List of Letters Patent which passed the Great Seal on the 22nd February, 1881.) (List of Letters Patient which passed the Great Seal on the 22nd February, 1881.)
3409. BREECH-LOADING CANNONS, P. JENSEN, Chancery-lane, London.—23rd August, 1880.
3427. TRIMING SOLES for Boorts, W. Morgan-Brown, Southampton-buildings, London.—24th August, 1880.
3442. CAPSULING BOTTLES, F. A. Glaeser, Bow.— 25th August, 1880.
3449. VESELS for HOLDING MINERAL WATERS, E. Edwards, Southampton-buildings, London.—25th August, 1880.
3450. HEALDS, H. Tetlow, Newton Heath, Manchester. —26th August, 1860.
3459. UNSINKABLE BOATS, W. E. Gedge, Wellington-street, Strand, London.—26th August, 1880.
3475. LETTERS and FIGURES, J. H. WIISON, LIETTERS and FIGURES, H. H. Lake, Southampton-buildings, London.— 27th August, 1880.
3504. ROTARY STEAM ENGINES, H. H. Lake, Southamp-ton-buildings, London.—28th August, 1880.
357. DOVETAILING MACHINERY, W. T. Mackey, Kings-land, London.—18th August, 1880.
3539. TREATING MACHINERY, W. T. Mackey, Kings-land, London.—18th September, 1880.
3539. TREATING LIQUINS, J. Storer, Glasgow.—1st Sep-tember, 1880. land, London.—1st September, 1880.
2539. TREATING LIQUIDS, J. Storer, Glasgow.—1st September, 1880.
25998. BICYCLES, C. D. Abel, Southampton-buildings, London.—4th September, 1880.
2616. AMALGAMATORS, P. B. Wilson, Maryland, U.S.—6th September, 1880.
2685. ATMOSPHERIC AIR ENGINES, H. Williams and J. Malam, Southport.—10th September, 1880.
2699. PECKS, HOES, C.G., G. R. Postlothwaite, Aston.—10th September, 1880.
2748. SHELLS for OBDNANCE, C. D. Abel, Southampton-buildings, London.—14th September, 1880.
2798. SPINNING MACHINERY, W. Jennings and T. Whitaker, Bradford.—18th September, 1880.
2837. HOUPPLATES, F. C. Glaser, Berlin.—22nd September, 1880.
2839. EXTINGUISHING FIRES, M. Windsperger and A. Schaedler, Finsbury-square, London.—18th October, 1880.
4319. PAINT BRUSHES, E. Wright, Beckenham.—22nd October, 1880.
4356. AERATED BEVERAGES, L. Shapter, The Barnfield, Exter.—25th October, 1880.
4356. AERATED BEVERAGES, L. Shapter, The Barnfield, Exter.—25th October, 1880.
4356. LECTRID LIGHTING APPARATUS, W. R. Lake, Southampton-buildings, London.— 3rd November, 1880.
4357. LOOMS, &c., C. Campbell, Kirkcaldy.— 8th Southampton-buildings, London.— 3rd November, 1880.
Southampton-buildings, London.— 3rd November, 1880.
Looms, &c., C. Campbell, Kirkcaldy. — 8th November, 1880.
BLEACHING AFPARATUS, W. Birch, Salford.—10th November, 1880.
BLEACHING, &c., GAS, W. R. Lake, Southampton-buildings, London.—10th November, 1880.
DURNING PERFOLEUM, &c., J. M. Forbes, jun., Cornhill, London.—16th November, 1880.
SEWER, &c., PITES, J. Lovegrove, Urswick-road, Lower Clapton.—23rd November, 1880.
Steller, J. H. H. Lake, Southampton-buildings, London.—6th December, 1880.
TELEPHONES, J. B. Morgan, Coleman-street, London.—8th December, 1880.
Slofe, GAS, A. P. Chamberlain, Finsbury, London.— 10th December, 1880.
TRAS, A. P. Chamberlain, Finsbury, London.— 10th December, 1880.
TRAS, A. P. Chamberlain, Finsbury, London.— 10th December, 1880.
TRAS, A. P. Chamberlain, Finsbury, London.— 10th December, 1880.
TRAS, TANDER, M. CANARATUS, H. V. HOEVEND 10th December, 1880.

List of Specifications published during the week ending February 19th, 1881. *187, 4d.; 1200, 2d.; 1668, 2d.; 1644, 2d.; 1790, 2d.; 1806, 2d.; 2882, 2d.; 2824, 2d.; 2842, 2d.; 2356, 6d.; 2382, 2d.; 2404, 4d.; 2429, 2d.; 2480, 6d.; 2500, 6d.; 2382, 2d.; 2404, 4d.; 2429, 2d.; 2480, 6d.; 2500, 6d.; 2710, 6d.; 2717, 6d.; 2718, 6d.; 2726, 6d.; 2760, 6d.; 2773, 8d.; 2735, 6d.; 2749, 6d.; 2755, 6d.; 2803, 2d.; 2865, 6d.; 2818, 10d.; 2857, 6d.; 2826, 6d.; 2869, 6d.; 2873, 6d.; 2818, 10d.; 2857, 6d.; 2806, 6d.; 2869, 6d.; 2873, 6d.; 2818, 10d.; 2857, 6d.; 2800, 6d.; 2869, 6d.; 2873, 6d.; 2875, 4d.; 2897, 6d.; 2800, 6d.; 2869, 6d.; 2873, 6d.; 2875, 4d.; 2897, 6d.; 2806, 6d.; 2869, 6d.; 2971, 2d.; 2024, 2d.; 2035, 2d.; 2967, 2d.; 2904, 7d.; 2966, 4d.; 2973, 2d.; 2974, 4d.; 2985, 2d.; 2989, 2d.; 2982, 2d.; 2983, 4d.; 2984, 4d.; 2988, 2d.; 2089, 2d.; 2991, 2d.; 2093, 2d.; 2094, 4d.; 2006, 2d.; 3001, 2d.; 2002, 2d.; 3003, 4d.; 3004, 2d.; 3005, 2d.; 3007, 2d.; 3009, 2d.; 3019, 2d.; 3022, 2d.; 4625, 6d.; 4753, 6d.

*** Specifications will be forwarded by post from the Patent-office on receipt of the amount of price and postage. Sums exceeding 1s. must be remitted by Post-office order, made payable at the Post-office, 5, High Holborn, to Mr. H. Keader Lack, her Majesty's Patent-office, Southampton-buildings, Chancery-lane, London.

ABSTRACTS OF SPECIFICATIONS.

London.

Prepared by ourselves expressly for The Engineer at the affice of Her Majesty's Commissioners of Patents.

1200. TREATING PAPER, &c., A. Annandale.—Dated 20th March, 1880.—(Provisional protection not allowed.) 2d.
So as to provent the fradulent alteration of printed or written matter on the paper, it is formed with a groundwork of one or more aniline or other like sensi-tive colours, so that no alteration can be made without injury to the colours.

1608. DIGGING POTATOES, &c., E. Loomes.—Dated 20th March, 1880.—(Provisional protection not allowed.)

2d. The shank of the share is placed in the rear of the evolving forks, thereby preventing the gathering of revolving forks, thereby preventing the gathering of potato tops or weeds on this part. The potatoes can be delivered either to the right or left, and pass over a screen, through which the earth escapes.

Screen, unrough which the earth escapes.
1694. BANKERS' CHEQUES, &c., J. A. Muller.—Dated 24th April, 1880.—(Provisional protection not allowed.) 2d.
On the back of the cheque is printed a combination of lines intersecting one another, the points of inter-section representing units, tens, hundreds, &c., and a hole is punched out at the required points, so as to indicate the amount for which the cheque is drawn.
17200 Force WARNERS & L. M. Descent Dated 1790. Foot WARMERS, &C., J. M. Drassy.—Dated 1st May, 1880.—(Provisional protection not allowed.)

2d. A woollen cap or calotte is knitted in one with a sole piece, and serves as a covering for the feet. On the sole piece is laid at suitable periods a product consisting of red African pepper and the leaves of the ecalyptus reduced to powder.

1806. HEATING THE WATER OF HOT-WATER APPARA-TUS, F. H. F. Engel.—Dated 3rd May, 1880.—(A communication from W. Fischer and T. Stiehl.)— (Provisional protection not allowed.) 2d. Steam injectors are placed in the conduit pipes, and by injecting steam into the water therein, heat the same

1882. BANKERS' CHEQUES, L. Simon.—Dated 8th May, 1880.—(Provisional protection not allowed.) 2d. This relates to the employment of columns of figures representing units, tens, hundreds, &c., by per-forating or punching which the amount of the cheque is indicated.

2324. CHECKING FARES ON OMNIBUSES, &c., A. R. Burman and W. H. Gambell.—Dated 9th June, 1880. —(Provisional protection and allowed.) 2d. Tickets of a different colour are used for each journey of the volucle, so as to prevent the conductor re-using a ticket.

2342. COLOURED GLASS WINDOWS, W. Morgan-Brown. — Dated 16th June, 1880.—(A communication from J. La Farge.)—(Provisional protection not allowed.) 201

To produce opalescent and iridescent effects in lass windows they are made of "opal glass."

2356. BINDING SAMPLES, &c., D. A. Tasker.—Dated 10th June, 1880. 6d. A is the main framing of the machine; B the table on which the samples are placed; D, knife passing through the opening in the table, the knife D being in connection with the piston E, and the movable slide bar F is pressed upwards by the cam or wiper G

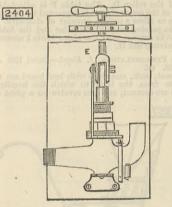
2356 D

E 0 0

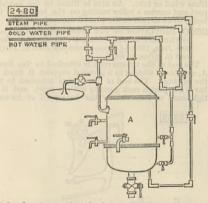
actuated by the handle H. J is the staple holder, and the staples are caused to enter the opening J¹, and may be inserted either by hand or by means of a suitableautomatic feed motion attached to J or to the main framing. K is the plunger or stamper, provided with a spiral spring for recoil, whereby the staples may be forced through the opening made by the knife in the patterns or samples under operation. **2382.** VENTLATING BUILDINGS, T. H. Thompson.— Dated 12th June, 1880.—(Provisional protection not allowed.) 2d.

allowed.) 2d. One of the tiles on the roof is made with passages communicating with the external atmosphere and with the inside of the building, the external openings being protected so as to prevent the entrance of 2404. WATER TAP, C. Burgess.-Dated 14th June, 1880.

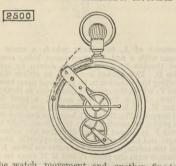
^{447.} This consists of a valve which can be attached to any ordinary water tap, being placed in the earth below freezing-point, and is used for the purpose of allowing the



water that remains in the service pipe, after the tap is turned off, to run away into the ground, so that there being no water in the pipe it cannot be frozen up. The opening and closing of the valves is actuated by means of the rod E, which screws down upon the valve and closes the water way. **2480.** MELTING AND REFINING FATS, &c., G. Hugon. —Dated 19th June, 1880. 6d. The fats are melted in a large quantity of water and the heat is applied to the vat A by means of a low steam jacket which does not reach higher than the



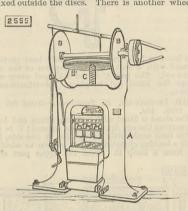
body of water, so that the fat as it melts and rises to the top is no longer in contact with the steam jacketted part of the vat, and is not subjected to greater heat than is given off by boiling water. 2500. CHRONOGRAPHS, W. H. Douglas. - Dated 21st June, 1880. 0d.
 A fine-toothed wheel is attached to the fourth wheel



long second hand. The last-named wheel is out of gear when not in use. To bring it into action a lever is raised which draws two flat bolts, the one on to a heart-shaped piece at the back of the wheel to cause the before-named second hand to move into position. To set the second hand in motion the lever is pressed down, thus lowering this bolt into a cavity and causing the wheel to fall into position. To stop the second hand the other bolt is pressed down which was drawn up with the same movement as the first bolt.

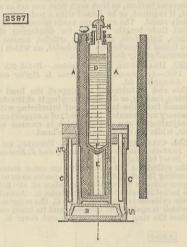
2429. SUBSTITUTE FOR WHALEBONE, F. C. Nutter.--Dated 10th June, 1880.-(Provisional protection not allowed.) 2d. Cane is dyed so as to have the appearance of whalebone.

bone. **2555.** FUEL PRESSES, J. W. Moore.—Dated 23rd June, 1880.—(A communication from S. Oustalet.) 4d. The machine is composed of a cast iron frame A, cast solid, having plummer blocks cast in one. These latter carry the brasses for a horizontal shaft, one end of which shaft is threaded and fitted with locking nuts, and a bush which works in one end of the rod for throwing the press in and out of gear. On this same shaft are fixed two flat discs B, with faces turned up true; on the other end of the shaft the driving pulley is fixed outside the discs. There is another wheel or



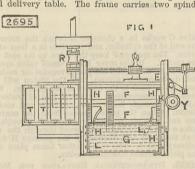
disc B¹ fixed to a vertical screw, this being leathered on the periphery, so as to cause a greater friction on the two discs on the horizontal shaft, these being fixed about Jin. further apart than the diameter of the screw disc over the leather. Motion is then given to the screw C by the discs on the horizontal shaft being forced by a hand lever against the periphery of the arc on the screw; one of course turning the screw in one direction, and, when the lever is reversed, the other disc turns it in the contrary direction, and thus the blocks are pressed on the downward stroke, and are lifted out of the dies on the upward movement. **2597**. IMPROVENTS IN ELECTRIC BATTERIES. A

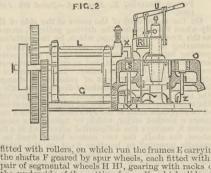
Inted out of the dies on the upward movement.
2597. IMPROVEMENTS IN ELECTRIC BATTERIES, A. V. Newton.—Dated 25th June, 1880.—(A communication from T. Tommassi.) 6d.
This invention relates to two fluid batteries, and the intention is to provide for a constant strength of acid, by the admission of fresh acid as wanted. The drawing shows a section of the battery. A is the porous pot with lower end conical in shape, containing the glass vessel D. The outce cell C is half the depth of A, and contains the earthenware piece B on which E a stand rests carrying D, which has a small opening F



for the discharge of the acid. D is fitted with a stopper G under the flange of which is a washer H to seal opening and prevent air getting into D. A spring I allows of the raising of G and the admission of air, the quantity admitted regulating the acid expelled. An arrangement is made to allow the escape of the exhausted acid on the introduction of the new, also for the constant amalgumation of the zincs.

2695. BRICKS, TILES, &C., J. D. Pinfold.—Dated 1st July, 1880. 6d. Fig. 1 is a plan of the improved self-acting cutting and delivery table. The frame carries two spindles

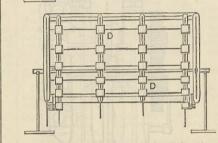




of the watch movement and another fine-toothed wheel is placed upon the centre wheel-arbor working in the first-named fine-toothed wheel and carrying a

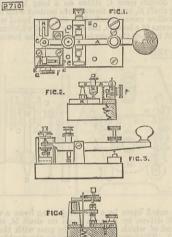
rollers L. Attached to the cutting frame is a horizontal plate which carries the stream of clay from the expressing dies over rollers T, mounted in a lubricating trough. To the outer frame E is attached a bracket carrying a bell-crank, on one end of which is a roller Y, which on being forced outwards by the clay, throws the clutch R into gear, so as to start the cutting and delivery actions. Fig. 2 is a section of a rotary con-tinuous action-brake press. The shaft G carries a bevel pinion gearing with a wheel on the underside of the rotary table O, in which the moulds are formed. On the axis of the table is mounted a radial arm R carry-ing a slide in which works the top plunger S, forming the top of each mould as it comes under it. This plunger is elevated by a spring connected to the lever U to which the plunger is attached, and is depressed by a tappet X on shaft L, whilst the bottom plunger of each mould is forced up by a tappet X¹ on shaft G. These bottom plungers are fitted with rollers Z, which travel over inclines so to deliver the unde bricks from the mould, when it is removed by the attendant. A hand lever brick-press is also described. 2700. METAL GATES, &c., S. Wilkes.—Dated 1st July, 2005 Edd 2700. METAL GATES, &c., S. Wilkes .- Dated 1st July,

Isso. 6d. This consists in the construction of gates, hurdles, &c., by running cast metal into chills placed around the joints of the separate parts to form the said articles, or to form the sections or lengths for the



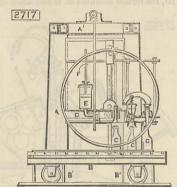
same. The drawing represents a front elevation of the frame or apparatus carrying the chills D, in which the bars and other parts of the hurdle are placed to receive around them the cast metal forming the joints. 2710. TELEGRAPH APPARATUS, C. Kesseler.--(A com-munication from F. Fuchs.)-- Dated 2nd July, 1880.

This improvement relates to an additional lever required by a Morse key, according to the circuit on which it is used. Two forms of arrangement of this contact lever are described, Figs. 1 and 2 showing first arrangement, Figs. 3 and 4 the other. It will suffice to describe one; the figures will show the difference in the other. The contact lever in Figs. 1 and 2 con-sists of a lever proper A, fulcrum at B, an adjustable contact screw C, a helical spring D. The bracket E supports B between centres G G¹ carrying bending



screw F. Under the outer end of A is an earth contact plate carrying a pillar with binding screw. The sup-porting bracket E is fastened to bed-plate of Morse key by two wood screws, H being fastened by one screw. The earth contact plate L of the Morse key is shortened at both ends, and limits the action of A. Figs. 3 and 4 show other arrangement.

Figs. 3 and 4 show other arrangement. 2717. BOTTLING MACHINES, G. Jones.—Dated 2nd July, 1880. 6d. A are fixed frames united by an entablature A^1 , and which are of a sufficient width apart to admit the small platform or wagon B to pass between them travelling on the grooved wheels and rails B^1 . C are the bottles; D is an adjustable working table, which

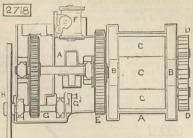


carries the filling, corking, sealing, and branding apparatus, and is raised, lowered, or adjusted to suit the heights of the bottles by means of screws and hand wheels. The filling pumps E are fitted to the working table, and their pistons are operated by the reciprocating motion of the crosshead F between nuts upon the piston rods of the pumps. 2720 Files of ENDER FOR HOLDING LETTERS for

upon the piston rods of the pumps.
2720. FILE OR BINDER FOR HOLDING LETTERS, &c., W. Downie. — Dated 2nd July, 1880. 6d.
This relates to means for removing the papers from the file, and binding them up into book form without the use of thread or string. A trough-shaped piece is fitted between two covers, and one of its sides is turned round at the upper part to receive a wire with a tube at each end, such tubes being sharpened at one end and projecting at right angles to the wire. The other side of the trough is fitted with a catch to receive and hold a wire extending from point to point of the tubes. When the file is required to be emptied the latter wire is removed and its ends inserted in the tubes of the file, when the papers can be transferred to it and the wire be pagin attached to the pointed tubes over which the papers pass.
2718. SUGAR-CARE CRUSHING MACHINERY, G. Buchancen

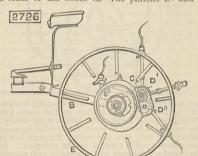
spur wheels D. The upper one of the three rollers C has a large spur wheel E upon its axis, and through this wheel the crushing rollers are driven. F is the

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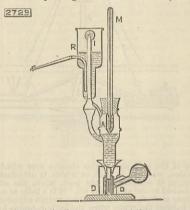
cylinder of the horizontal steam engine, which is the motor; the rod of its piston is coupled by a connecting-rod with a crank G^{\dagger} at the end of the crank shaft G; H is the fly-wheel.

G; H is the fly-wheel.
2726. HAY-MAKING MACHINES, J. Honcard and E. T. Bougheld.—Dated 3rd July, 1880. 10d.
A are cast iron boxes which form, with the frame irons B bolted thereto, the side frames of the machine; C is a dead shaft upon which the fork or time barrels are mounted loosely. The travelling wheels E are fitted with lantern wheels E! for transmitting rotary motion to the time barrels. Keyed to the sleeve of the fork barrels on each side of the machine is a spur pinion D¹ for gearing into the adjacent lantern wheels E!, and in gear with these pinions are idle pinions D² mounted on axles fixed in the sides of the boxes A. The pinions D¹ and D²



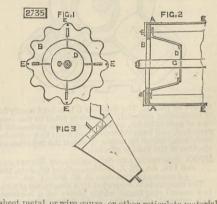
remain always in gear with each other, but the motion for driving the barrels may be transmitted directly through the pinions D¹ or indirectly through the pinions D². Thus, when the rotation of the barrels is required to be in the opposite direction to that of the travelling wheels the pinions D² will be idle, but when the reverse direction is required to be given to the tine barrels the driving motion will be transmitted through the pinions D² to the barrels.

through the pinions D² to the barrels. 2729. STEAM TENSION MANOMETER FOR ANALYSING LIQUIDS AND STUDYING PRESSURES, L. Perrier.— Dated 3rd July, 1880. 6d. The manometer consists of a glass tube M ending in a tapering point, to which a reservoir is soldered and contains quicksilver to near the top, the upper part being occupied by a volatile liquid. This reser-voir dips into the boiler A containing the liquid to be analysed, and beneath which is a lamp D₁^tto make such liquid boil, when its vapours rise in the central pipe of the refrigerator R, where they condense, and, after having heated the water therein, pass out. The pipe I directs the vapours against a mirror of metal; thus it

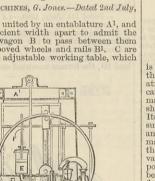


is easy to ascertain the pressure. At this moment, by their tension, the vapours exactly equipoise the atmospheric pressure. These vapours have communi-cated their temperature to the reservoir of the manometer and to its contents. The liquid therein should be more volatile than the liquid to be examined. Its vapour overcomes, firstly, the atmospheric pres-sure to which it is submitted through the quicksflver, and raises a column of quicksflver in the pipe of the manometer until the atmospheric pressure added to the weight of this column equipoises the tension of the vapour of the liquid in the reservoir. The elastic power of the two liquids under experiment can then be compared. The hamp D is constructed so that the flame will always be regular.

2735. SEPARATING GRAIN, &c., T. Perkins and S. Handscombe.—Dated 3rd July, 1880. 6d. Fig. 1 is a transverse section, and Fig. 2 'a longi-tudinal section of one end of a rotary screen, having longitudinal corrugations formed in the perforated



the tubes of the file, when the papers can be transferred to it and the wire be again attached to the pointed tubes over which the papers pass.
2718. SUGAR-CANE CRUSHING MACHINERY, G. Buchanan and W. A. Keay.—Dated 2nd July, 1880, 6d.
The drawing represents a plan of the machine. A is the bed-plate; B the standards carrying the bearings of the crushing rollers C, geared together by the

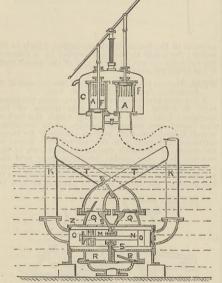


2700

this allows the shoot by which the material is fed to the screen to be brought close to, or even to project somewhat into the screen. E are bars which tie together the two end rings, and also serve as supports for the corrugated screening surface. Fig. 3 is a side elevation of a screen constructed in this manner.

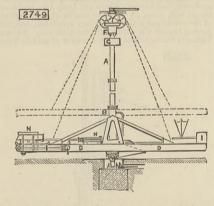
elevation of a screen constructed in this manner. 2733. RAISING WATER, A. M. Clark.—Dated 3rd July, 1880.—(A communication from F. Housse.) 8d. This relates to improvements in pumps in which columns of water oscillating in pipes are substituted for rods, pressure being applied above the columns by an upper pump and transmitted by the liquid to a double piston at the bottom of the columns, of which there are two acting alternately upon opposite sides of the piston. The upper pump consists of two barrels A, each having through slots, and placed in a tank C provided with a delivery pipe. Each barrel has a

2733



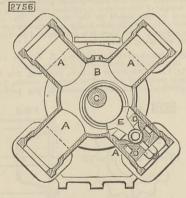
piston F fitted with a clack valve opening downwards and connected to rods attached to the pump handle. Flexible pipes K connect the barrels respectively with one end of the lower pump barrel, divided by a central partition M into two chambers. Through this parti-tion passes a rod N coupled to the pistons O. Above the barrel are delivery valve boxes Q each containing a clack valve, and beneath it is another valve-box con-taining two inlet valves R communicating with the pump barrel by openings S. The delivery valves open respectively into branch pipes T leading into the flexible pipes K ; Z are relief ports.

flexible pipes K; Z are relief ports. **2749.** CENTRE CRANES, &c., T. Wrightson.—Dated 5th July, 1880. 6d. The object of this invention is to relieve the central standard from the heavy strain exerted when a heavy load is suspended from the end of a long jib or arm. A is a central post supported in a water pivot, and surrounding part of it is a cylinder B, which turns with the post, and is fitted at bottom with a gland of larger diameter than at top, so that by admitting water to the cylinder it will rise on the post. D is an arm or jib extending on both sides of the post and supported on pivots at the bottom of the cylinder, on which it can slightly rock. A frame F is fixed on the



op of the post and carries sheaves over which pass chains, one end of each of which is attached to a weight G surrounding the post, while the other is attached to one end of the jib. H is a ladle to contain 8 tons of steel, and I is a balance weight adjusted so as to balance the cradle when the ladle contains half its charge. N is a cylinder for moving the ladle along the jib. to balar charge. jib.

2756. PUMPS, U. Bromley, G. Crowe, and W. James.— Dated 6th July, 1880. 6d. Single-acting pumps are formed with two, three, four, or more cylinders A, with their inner ends opening into a central chamber B, in which revolves a crank shaft C, to which the pump pistons D are con-



nected by rods E. The chamber B is is kept nearly full of lubricating material. A cover is fitted to the outer end of each cylinder, so as to enable the pistons to be repacked, and from this end a port leads to a valve-box containing valves by means of which the injection and ejection of the fluid is effected.

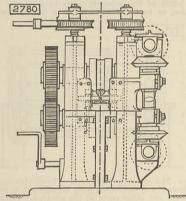
ejection of the fluid is effected.
2760. SUSPENDED AND SELF-LEVELLING RECEPTACLES FOR INS, &c., H. J. Haddan,—Dated 6th July, 1880. —(A communication from B. W. Stiles.) 6d.
The receptacle is supported by a ring frame pivotted to a second ring frame which pivots on a horizontal axis perpendicular to the pivots of the first ring, so as to obtain a sort of binnacle attachment. The cover is made in two halves hinged to the receptacle and open-ing outward from the centre so as maintain the equilibrium of the receptacle, each half of the cover having a projection which, when open, rests on a band placed round the opening to the receptacle, and can be

passed through openings in the inner ring and by a turn secure it in place.

turn secure it in place. **2775**. PREPARING EXPLOSIVE MATTER, A. Hellhoff.— Dated 7th July, 1880. 4d. Concentrated nitric acid is gradually added to tar oils and the product when mixed with salts, which, by decomposing liberate oxygen—by preference with the nitrites of alkalies, chlorate of potash, or with nitric acid—produces an explosive compound of a very high so-called crisant effect.

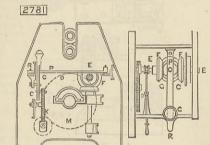
2780. STRAIGHTENING OR BENDING RAILS, &c., E. W. Richards and S. Godfrey.-Dated 7th July, 1880. 15

Is. A series of upper and lower horizontal rolls are used in conjunction with a series of vertical rolls, so arranged that the rail during one traverse through the machine is caused to pass first through one series and after-wards between the other series of rolls, so that it is straightened in two directions at right angles to one another while the rail travels in one direction, or it may be made straight, as seen in side elevation, and curved as seen in plan. One roll of each pair is made adjustable, and is driven indirectly by spur gearing, while the other is driven directly by worm gearing. From the second set of rolls the rail is caused to pass



on to "live" rollers, and conveyed to a slotting or grinding machine; thence by other "live" rollers to a drilling or punching machine, afterwards to a turning apparatus, and finally conveyed by a chain to the inspector's or rail bench, whence it is lifted and placed on trucks or carried to stock, the whole of the operations being effected automatically.
2781. DRIVING AND REVERSING GEAR FOR WASHING MACHINES, &c., E. Taylor.—Dated 7th July, 1880. 6d.

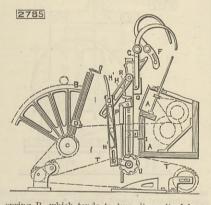
 6d . This relates to improvements on patent No. 2393, A.D. 1874, and consists in causing the tub to revolve a certain number of times in one direction, and then be automatically reversed and revolve the same num-ber of times in the opposite direction. For this pur-pose a double cone C slides on a long key on the driving shaft E, and is moved into contact with either of the hollow cones attached to the two bevel wheels F by means of a lever G, the upper end of which carries a weight to keep the cone in contact. The lower end



of G is acted upon by a pin projecting from a worm wheel K driven by a worm fixed on shaft M, at the other end of which is a pinion in gear with the box wheel O. The lever G is connected to the double cone C by a horizontal lever P carrying a bowl acting between the two cones; R is a pin to hold both cones out of gear, and lever G in a vertical position when required. When the pin on the wheel K comes against the lever G the cone is drawn out of contact, and the weight at top of G throws the latter over, and brings the cone in contact with the other wheel on shaft E, thus reversing the direction of the tub.

2785. REGULATOR FOR SPINNING ENGINES, M. Bauer —Dated 7th July, 1880.—(A communication from J.

Jacqu's 160. (d. and a study 1600. (d. communication from s. Jacqu's) 6d. A is the mule carriage, E the support for the regu-lating apparatus, F the "faller" arm, and G the "counter faller" arm. F and G are extended down-wards, and carry studs which act upon the parts H and H¹, the former mounted on E and acted upon by

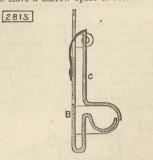


a spring R, which tends to turn it on its fulerum. Q is a ratchet mounted on H, and with it a pawl con-nected with lever P genrs. The lever H1 turns on a pivot on H, and consists of two parts jointed together, between which is a spring tending to keep them in a straight line. A spring is placed between H and H1, and tends to keep them also in a straight line. On the lower end of H1 is a stud on which a small lever turns, its other end being slotted and passing over the shaft of the ratchet wheel J. On the same shaft is a chain wheel, over which passes a chain T, such chain also passing over a wheel on the quadrant B. If the yarn becomes too tight the lower end of arm F moves towards the left hand, and its stud moves the upper end of H so as to bring it vertical, when the small are moved to the right, and the stud takes into the teeth of the ratchet J, which it prevents turning. The chain T then acts on the wheel or quadrant B, thus moving the nut D so as to relax the winding on chain.

CHAIN.
 2803. SECURING COLLIERIES AND MINES FROM EXPLOSIONS, &c., J. Daye.—Dated Sth July, 1880.—(Provisional protection not allowed.) 2d.
 The holes for blashing purposes are made much smaller than usual, and a smaller charge inserted

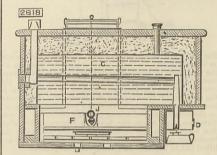
therein. Electric signalling apparatus is connected with all parts of the mine so as to be able to commu-nicate at once the state of the mine, both before and after blasting, to the firer of the charge. The currents of air passing to the mine are saturated with aqueous vapour, so as to prevent the explosion of the gases given off by the coal or the combustion of gunpowder. Sand or other inflammable element is used to prevent the spreading of combustion, in place of water. **20215** Records Top House, WIND ROPS.

2815. BRACKETS FOR HOLDING WINDOW-BLIND RODS, &c., R. B. Evered.—Dated 8th July, 1880. 6d. The bracket consists of two parts B and C, the former screwed to the sash and bent upwards at its lower end so as to leave a narrow space to receive the end of



the band or lath, and the upwardly bent portion is formed with a seat for the reception of the upper blind rod. The part C forms a hinged cover which keeps the blind rod in place. Modifications are shown.

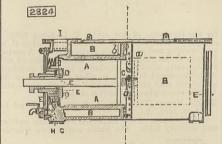
2818. INCUBATORS, H. Tomlinson.-Dated 9th July, 1880. 100. 100. The stand is fitted with a sliding frame and leg for supporting the egg drawer when opened; C is a hot water tank made with a projection at one side, fitted with a heating chamber open at bottom to admit hot air from a lamp D. From the upper part of this



chamber tubes pass through the cistern and into an outlet tube. The egg drawer F is placed below the cistern C. H are openings for ventilation. The tube J is partly filled with water, and should the tempera-ture become too high, a flexible piece attached to J is distended and opens a suitable valve.

a become too high, a nexhife piece attached to J is distended and open a suitable valve.
2821. DISPLAYING CLOTHING IN SHOP WINDOWS, &c., F. Mellvenna.—Dated 9th July, 1880. 6d.
Busts or blocks are made of light air-proof material, and when required for use are inflated. Each bust is made in two separate halves joined togother by a collar at top and bottom, so that each part can act as a side bust, if required, or be joined with a pedestal to form a body stand. The arms are made telescopic so as to adjust their length. Stands for displaying shirts, cravats, hats, fans, and other articles, consist of a wire frame supported on a pedestal, on which it can be secured at any desired angle.
2822. HEAD REST, H. J. Huddan.—Dated 9th July, 1880.—(A communication from L. Heffter and T. Schuppli.) 6d.
This read ing, or drawing, keeping it at the desired distance from the table without interfering with the necessary movements. It consists of a support capable of adjustment, one end of which is secured to the table.
2824. CYLINDERS FOR PUMPING, FORCING, OR COM.

table, while the other supports the head.
2824. CYLINDERS FOR PUMPING, FORCING, OR COM-PRESSING AIR, &c., M. Kennedy and J. Eastwood,— Dated 9th July, 1880. 8d.
The cylinder A is formed with an outer water box or cooling jacket B, divided in the centre so as to leave a space suitable to receive a number of air holes b. The jacket B is also formed with holes a. At each end of the cylinder is a delivery valve C, the outer seating against the ring D bolted to the end cover E. The



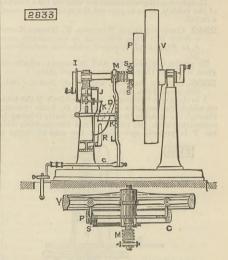
valve C works in a chamber between the cover and the end of the cylinder, and can slide in a boss of the cover. The springs F keep the valve to its seat G in the piston. In the cover E is a small valve opening inwards, so that when the piston recedes air rushes in and destroys the vacuum, and the piston will then move freely back to the centre of the cylinder. When used for compressing air small jets of water are injected through holes b to lubricate and cool the piston. When the piston moves from the centre to one end, the air previously admitted through the holes a and b is inclosed and forced through the valve C at that end and thence by the passage H to the delivery pipe I. The same action takes place when the piston makes its return stroke. the piston makes its return stroke.

2883. DYNAMOMETRICAL REGULATOR FOR MOTIVE POWER ENGINES, X. Moussard.—Dated 9th July,

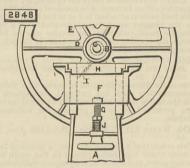
Powere ENGINES, X. Moussard.—Dated 9th July, 1880. 6d. On the main shaft of the motor at the side of the fly-wheel V is mounted the driving pulley P, secured to the fly-wheel by springs, which, by the variations occurring in the resistance caused by stopping or putting into action machines, or by any other cause, are compressed or relaxed, and an angular movement orynamometrical movement of rotation is changed into a movement of translation following the axis of the main shaft by forming a rack C concentric with the main shaft on the end of a lug projecting from each of two opposite arms of the fly-wheel. Into each rack gears a toothed sector, which, by means of a second above the shaft, the two sectors being fixed on a spindle mounted in bearings fixed on the driving pulley P. The oscillation of Simparts at-o-and-fro move-ment to a sleeve M mounted on the main shaft, and connected to a lever L pivotted to a rod D hinged to the frame of the motor. The movement of L is trans-mitted by a rod G to a valve, and thus regulates the admission of steam or gas. "When desired to remedy the irregularities of the power, a small cylinder with

Feb. 25, 1881.

a piston is fixed on the frame of the motor, and is in communication with the boller or generator by the pipe I. The piston rod bears against a lever J jointed to the frame, and a spring R, which is in equi-librium at the determined pressure in the generator, constantly solicits this lever towards the correspond-ing or equilibrium position. The oscillation of lever J caused by the variations of pressure in the generator are transmitted to the lever L by means of levers K



There is, therefore, still the one direct instantaneou action of the pressure in the generator on the admis, sion, an action entirely independent of that given by the variations of the resistance. This arrangement constitutes, therefore, an auto-regulating manometer. 2848. PLANING WOOD, S. S. Hazeland.-Dated 10th July, 1880. 6d.



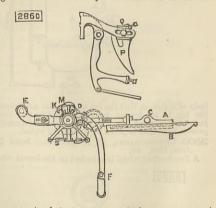
tion of the roller D. The table F is adjustable by means of the screw G, and is supported by the spring J, so as to allow a certain amount of elasticity. The wood, in passing between the roller and the table, is brought in contact with the plane blade I secured in the receiving box H.

2857. PERAMBULATORS, J. Lloyd.—Dated 10th July, 1880. 6d. The seat, back, and sides with heel board are made separate from the body to which the handle and wheels are secured, and can revolve on a pivot so as



to shift its position and thereby shelter the occupant from wind or rain. An arm is fitted to the movable part and carries a roller resting on the bottom of the body, so as to relieve the pivot from undue strain.

body, so as to relieve the pivot from undue strain. 2860. REGULATION OF THE SPEED OF THE CARRIAGE or THE SELF-ACTING MULE, W. A. Bavlow.-Dated 10th July, 1880.—(A communication from C. Pfeiffer and H. Offroy.) 6d. The end of the return cord is attached to the frame A, capable of sliding in a grooved support B fixed on the carriage. The end of this cord is attached to the bar C carrying a rack gearing with a pawl, and it is tightened or loosened by the backward or forward



movement of A, to obtain which a screw on A ongages with a nut, the movement being communi-cated thereto by bevel wheels driven by spur and pinion D. This pinion can turn in either direction according to the action to be produced upon two levers E and F, which the spring S maintains in their proper position. I is a fixed stop and K a pawl held in bracket M. If lever E is turned in one direction the pawl supported by the arm L becomes free and engages with pinion D, causing it to turn from right to left. If lever F is moved in one direction the other pawl engages and turns pinion D in the opposite direction. When the carriage runs in the roller on lever, E comes in contact with the piece P, and if it runs in at too great a speed this piece turns and is held by a catch Q, so that when the carriage is withdrawn the lever E is turned so as to tighten the cord. A piece fixed on the floor at the extremity of the frame of the headstall

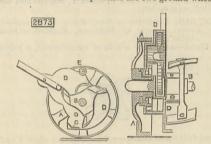
acts similarly on the lever F and serves to loosen the

cord.
2869. ASBESTOS PACKING RINGS, &c., H. Wedekind.— Dated 12th July, 1880.—(A communication from H. Bollinger.) 6d.
A hank of asbestos thread A is wound over two rollers B, one of which is rotated by gearing from the pulley C, while the other runs loose, and is adjustable to suit the size of the ring to be made. During the forward movement of the hank or core A over the rollers, the spool F fixed on the revolving box H gradually winds thereon an asbestos thread. When

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the ring has attained a certain thickness, should it be wished to give it a covering of wire, the spool F is replaced by another supplied with wire. To enable the ring to be removed from the box H, it is made with a slot throughout its length. To prevent any interruption in rotation through the break in the con-tinuity of the spur wheel on the box, it is driven by two separate spur wheels, adjusted to take it at different parts of its periphery.

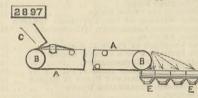
amerent parts of its periphery. 2878. LAWN MOWING MACHINES, W. P. Thompson.— Dated 12th July, 1880.—(A communication from P. P. Mast.) 6d. This consists in the manner of hanging the cutter head in the machine, in the construction and arrange-ment of the driving gear, and in the construction of the main frame. A represents the two ground wheels



mounted on journals on the sides of the main frame; B the rotary cutting head, and C the fixed blade or knife at the bottom of the machine. The main frame consists of two side or end plates D, a cross brace E, connecting the plates at the top, and the knife or knife supporting bar C connecting the plates at the bottom.

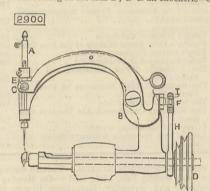
supporting bar C connecting the plates at the bottom.
2875. PULVERULENT PREPARATIONS OF PHOSPHORIC ACID FOR THE MANUFACTURE OF BAKING POWDERS, &c., J. H. Johnson.—Dated 12th July, 1880.—(A communication from E. N. Horsford.) 4d.
This relates to improvements on patent No. 2161, A.D. 1856, and consists in the reduction to a pulve-rulent condition of phosphoric acid uncombined with a base or dissociated from acid phosphates formed therewith, by its admixture with a neutral substance they are the substance of the pulposes of reaction upon alkaline carbonates, without the waste and expense attending its partial neutralisation by a base.

Daso.
2897. SEPARATING THE FINER AND COARSER PORTIONS or LIME, CEMENT, &c., T. Hicken and J. Hopevell. —Dated 13th July, 1880. 6d.
A is an endless band or apron passing around drums B B¹; C is a shoot through which the ground cement or other substance is supplied from a hopper. E E are



a series of hoppers or receptacles placed in line with the apron A and at some point below the level of its upper surface, preferably entirely below the level of the drum B^1 as shown. 2900. SEWING MACHINES, T. Fletcher.-Dated 14th July

2900. SEWING MACHINES, 1. Provide a line of the second sec



driving—shaft; H is a connecting rod which actuates the arm B when the shaft D is set in motion; F is a stud screwed into one end of the arm B. In this stud is an annular groove to receive an india-rubber washer I; on one end of the connecting rod H is formed an annular clamp to pass over and form a bearing for the stud F, the other end of the connecting rod is bored to fit the excentric on the driving shaft. 2921. Bactes, R. T. Williams—India 15th July 1850

2921. Braces, R. T. Williams.—Dated 15th July, 1880. —(Not proceeded with.) 2d. To each front buckle in addition to the ordinary end a separate clip is attached, the clipping ends of which are undulated, and are passed over the waistband of the drawers, so as to suspend them independently of the trousers. 2924. TREATMENT OF GAS, C. Edwards .- Dated 15th

2024. IREATMENT OF GAS, C. Edwards.—Dated 15th July, 1880.—(A communication from L. H. Pottinger, W. P. Monkhouse, E. Artlet, jun., and T. J. Thomp-son.—(Not proceeded with.) 2d. The gas is brought into contact with a hydrocarbon liquid that gives off an inflammable vapour at a temperature of less than 110 deg. Fah., whereby the gas becomes charged with such vapours and its illumina-ting and heating powers correspondingly increased. 2987. LOCK AND. LUCCE Foregreened and the super-sont sector.

2937. LOCK AND LATCH FURNITURE, H. Brittain.— Dated 16th July, 1880.—(Not proceeded with.) 2d. The rose is in the form of a tube with a fiange at one end, the other end being sit, so that when passed through the hole in the door through which the spindle is to work, it can be opened out and thus secured in

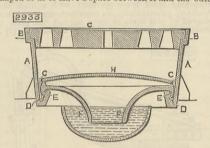
position. Escutcheons of locks may be similarly fixed. A Second part of the invention relates to the means of attaching knobs to their spindles. position.

2904. REFRICERATING APPARATUS, W. R. Lake, —Dated 14th July, 1880.—(A communication from A. J. Chase.) 6d. A indicates the vessel for containing the refrigerating material; Λ¹ is an escape pipe; B is a vessel for

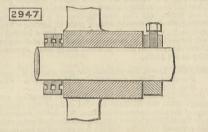
2904

collecting and holding the liquid resulting from the melting of the ice; C are pipes or air conduits.

2933. TRAPPED GULLIES OR GRATINGS FOR STABLES, *&c., c. W. Burge,—Dated 16th July,* 1880. *6d.* A is the ofter case, having a rabbet B round the top edge to receive the grid or cover C. At the bottom edge is a recessed groove D to receive a tongue E formed round the lower edge of the trap E. At the top edge of the trap F is formed a rim or bead G which is shaped so as to leave a space between it and the outer



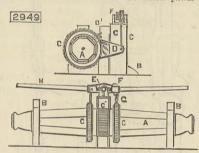
case A; this space when the trap is in use becomes filled with sediment, and thus a perfectly air-tight joint is formed all round the outer case A indepen-dently of the water contained in the groove D. This bead or rin also supports a strainer H, which is formed with a convex upper face which assists in throwing the sediment to the sides of the trap. **29247.** AXLES AND WHEELS FOR RAILS, W. Harker.— Dated 17th July, 1880. 4d. One wheel only is fixed rigidly upon its axle, and the other is allowed to revolve on the axle indepen-dently of the fixed wheel; the sliding of the loose wheel along the axle being prevented by collars



attached to the axle by set screws or by other suitable means, or by a collar forming part of the axle on the one side, and loose collars on the axle on the other side. The drawing shows a section of the boss, axle, and fast and loose washers.

2949. SHIPS' WINDLASSES, A. Steenberg.—Dated 17th July, 1880.—(A communication from M. A. Thundsen.) 6d.

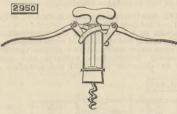
 $^{6d.}$ A is the barrel of the windlass; B the standards; C are ratchet wheels mounted on and firmly secured to the barrel, and into the teeth of which the movable pawls D, carried by a lever which is free to turn on the barrel, take to vork the windlass. C¹ is a third ratchet wheel which receives the fixed pawls D,



which serve to prevent any back motion of the barrel; E is a pillar or standard on the top of which the usual rock lever F for actuating the pawls D is pivotted. G G are the rods which connect the rock lever to the movable pawls D; II H are handles which fit into the sockets at opposite ends of the rock lever F, whereby this lever is worked on its pivot in alternate directions to work the windlass.

2950. CORKSCREWS, W. B. Baker.-Dated 17th July

1880. 4*d*. This consists in constructing corkscrews with a body or case to fit over the neck of the bottle. The screw passes down through the centre of the case. Projecting from the sides of the case are two arms,



to each of which is hinged or pivotted a lever; below the head or thumb piece of the screw is a projection collar or boss, against which the lever arms are brought to bear in order to raise the screw, and thus draw the cork out of the bottle.

2955. DRIVING BELTS OR BANDS, W. R. Lake.—Dated 17th July, 1880.—(A communication from R. Müller.) —(Not proceeded with.) 2d. The driving belt is made of woven metallic wire, the warp consisting of steel wire, and the weft threads of thin wire rope made of fine twisted iron wires. The waft is worked into the belt so that it encloses one of the warps at each edge of the belt, while the remain-

ing portion takes hold of two warps, by which means the belt can neither stretch nor slip on the pulleys when in use.

2957. SPIROMETERS, W. Downie.—Dated 17th July, 1880.—(Not proceeded with.) 2d. A flexible bag capable of being distended by air expelled from the lungs is fitted with a tube, and when distended the tube is closed and a measuring tape passed round the bag, on which are figures indicating the amount in cubic inches of air in the bag. 2961 Pacep Furges F. P. Matter Deviating the tape

the amount in cubic inches of air in the bag.
2961. PAPER FILTERS, F. R. Mallet.—Dated 17th July, 1880.—(Not proceeded with.) 2d.
The filters are made in one conical piece by introducing hollow cones, permeable by water into the pulp vat, and by suction sufficiently freed from water to allow of the cones being withdrawn from the vat.
2966. PRODUCTION OF SUBFACES FOR PRINTIG, STAMPING, OR EMBOSSING, J. J. Sachs.—Dated 19th July, 1880. 4d.
A piece of lace or other open work fabric is arranged round a roller and placed in a bath containing a metallic solution connected with an electric current, the roller preferably being caused to revolve therein. The lace serves as a resist while the metal is deposited on its interstices. The lace is removed and the roller is ready for printing, stamping, or embossing with in the ordinary manner. ordinary manner.

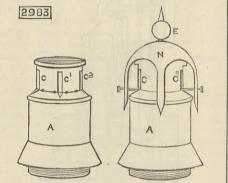
2974. DRIVING BANDS, &c., J. and J. Lee.—Dated 19th July, 1880.—(Not proceeded with.) 2d. The belt is made of cotton, felt, linen, or other fibrous materials seew or rivetted together by metallic wire or fastenings.

Wrie of nastenings.
2975. APPLYING OXIDISED OIL or SOLIDIFIED OIL COMPOSITIONS TO PANELS, &C., F. Walton.—Dated 19th July, 1880. 4d.
For applying the oxidised or solidified oil composi-tion engraved metal dies or rollers are used, the com-position being applied in a plastic state, and consider-able pressure employed. The articles are hardened off by exposure to a moderate heat for a considerable time.

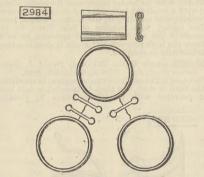
by exposure to a moderate heat for a considerable time.
2980. RECULATORS FOR ELECTRIC LAMPS, A. M. (Clark. — Dated 20th July, 1880. (A communication from J. H. Guest.)—(Not proceeded with.) 2d.
This invention is for automatic regulation of the length of are and to prevent fluctuation in the light of electric lamps. It consists, First, in a thermoscopic rod combined with an electric lamp for expansion, according to intensity of current and resistance. The lineal expansion is multiplied by levers, which act by clamps to separate the carbons. It also consists in the combination with the expansion rod of a section of carbon, or metal of low conductivity, whereby the heat due to resistance is rapidly generated and dissi-pated also in a shunt for dividing the current when the carbons are separated to a definite point, and other details which renders the action more perfect and adjustable.

adjustable. **2982.** WATER-CLOSETS, &c., P. Keppie.—Dated 20th July, 1880.—(Not proceeded with.) 2d. The closet basin with the inlet and overflow horn are made of delf, and the basin is directly fitted and attached by a simple luting over the trap bend of the soil bend, which is made of delf, lead, or fireclay, and fitted to rest on a bracket below the basin. The seat is hinged and held up by a spring when notin use, but when depressed it actuates a valve which supplies water to a tank for the flushing operation. **2002** CULVERY PORCE I. A Court Basin Control Laboratory of the seat of the s

2983. CHIMNEY-POTS, L. A. Groth.—Dated 20th July, 1880.—(A communication from P. Dencausse.) 4d. The upper part of the body A is recessed or nar-rowed so as to form a neck to provoke a draught in the chimney. This neck is provided with openings C C¹ C², and through which the smoke passes into the



open air. The top of the neck is also provided with a recess or rim having a number of holes through which the smoke can also pass; E is a cover provided with supporting arms or branches N N, which are placed opposite to and made somewhat wider than the open-ings CC¹C², so as to mask completely those openings. 1988 COCC, so as to mast compactery more openings. 2984. REPAIRING STEAM BOILERS, A. C. Henderson.— —Dated 20th July, 1880.—(A communication from L. Knölke.) 4d. This consists in the use and application of plain quoins or wedges flanked with spindles, which may



be either conical, circular, or polygonal, for the pur pose of closing fissures in steam boilers, and for the rins or flanges of wheels.

2988. GEAR WHEELS, R. Hadfield,—Dated 20th July, 1880.—(Not proceeded with.) 2d. In casting the wheel the arms are abolished, a double disc or continuous plate being cast simul-taneously with the nave and rim in one piece.

taneously what the have and rim in one piece.
2989. IMPROVED ELECTRIC PILE, M. S. and P. S. Asapis.—Dated 20th July, 1880.—(Not proceeded with.) 2d.
This is an improvement on the Bunsen and Daniell batteries, and consists in substituting for the acid or acidulated liquid usually used in the outer vessel, a solution in distilled water of any salt, but particularly cyanide of potassium, or caustic potash, or salcyanide of potassium, or caustic potash, or sal-ammoniac in proportion of about ten parts of salt to one hundred of water; or instead of the above an infusion or decoction of sulphate of quinine and quassia amara can be used; for sulphate of quinine

use about 3¹/₄ grains of quinine for 555 grains of water; for quassia amarsa employ the same proportion as for the salts above. The liquid in the inner vessel is left as in a Bunsen or Daniell battery. 2991.

WATER VELOCIPEDES, H. Whitehead and J. ow.-Dated 20th July, 1880.-(Not proceeded Snow.with.) 2d. This relates to a vessel propelled by a single paddle-wheel driven by the feet of the occupant of the vessel in a similar manner to a bicycle.

In a similar manner to a bicycle. **2993.** DUMFING BOATS, H. E. Newton.—Dated 20th July, 1880.—(A communication from N. Barney.)— (Not proceeded with.) 2d. The boat consists of two water-tight compartments pivotted to opposite sides of a series of cross-beams carrying a platform or deck. The end plates of the compartments are provided with cog teeth, which, as the bottom is opened or closed, engage with each other, and guide the parts in their proper position. **2994.** SOLUMIE SULCATES. J. Duke.—Dated 20th. July. 2994. SOLUBLE SILICATES, J. Duke.-Dated 20th July,

other, and guide the parts in their proper position.
2994. SOLUBLE SILICATES, J. Duke.—Dated 20th July, 1880. 4d.
Portland or Roman cement, or any suitable natural silicate, is treated with hydrochloric acid in excess, whereby it is converted into a gelatinous mass consisting of the silicates of potash, magnesia, and soda, the mineral known as kainite is treated in a similar manner to the cements or natural silicates; but in lieu of hydrochloric acid, sulphuric acid may be employed if preferred. The soluble silicates thus obtained in a gelatinous condition are mixed together and used in the manufacture of manure by combining therewith, first, superphosphate of lime, or other phosphates, and then peat, charcoal, or dried peat.
2998. CASING ARTICLES IN COPPER, BRONZE, &C., P. M. PAYSON.—Dated 21st July, 1880.—(Not proceeded with.) 2d.
To obtain sound castings pressure is applied to the metal in the mould while in a fluid or soft state by forcing a plunger into the mouth of the mould.
3001. PRESERVING FOOD, &C., F. Artimini.—Dated 21st July, 1840. 2d.
This relates to improvements on patent No. 2577, dated 26th June, 1879, and consists of from 1 to 14 parts, by weight, of tartaric acid added to from 1 to 15 parts of boric acid, both dissolved in water and the poslution subjected to heat. When hot about half its volume of alcohol is added, whereupon a seum forms on the top of the liquid, which scum is removed and dried and forms an antiseptic to be used for the preservation of meat, poultry, game, fish, and butter.
3002. PACKING AND CONVENING OR HOLDING EGGS, J. Helley.—Dated 21st July, 1880.—(Not proceeded strest of light, july, jul

3002. PACKING AND CONVEYING OR HOLDING EGGS, J. Halley.—Dated 21st July, 1880.—(Not proceeded with.) 2d.

with...) 2d.
The eggs are placed in a box fitted with trays, having holes lined with an india-rubber cup to receive and grip the egg.
3003. BRICKS, TLES, &c., E, J. Shackleton and G. J. Kemp.—Dated 21st July, 1880. 4d.
Clay, earth, or other materials suitable for the manufacture of plastic materials are, without separation from any hard substances, such as stones, placed in a mortar mill having heavy edge runners, which crush the materials to a pug mill for preparing it for the manufacture of plastic forms in any known manner.
3004. STOPPEE FOR BOTLES, C. T. and D. C. Miles.—

3004. STOPPER FOR BOTTLES, C. T. and D. C. Miles, – Dated 21st July, 1880. – (Not proceeded with.) 2d. The stopper consists of a cap to close the mouth of the bottle, and having a thumb piece at top and depending clips at its sides, to take under the rim round the neck of the bottle.

SOO5. VENTLATING MINES, J. Clark.—Dated 21st July, 1880.—(Not proceeded with.) 2d. Air is forced into the mine by a fan, and at the outlet or upcast shaft to a valve to throttle or regulate the exit of air, so that the pressure of air in the mine is kept above the pressure of the atmosphere.

8006. APPLYING COATING TO PHOTOGRAPHIC PLATES, &c., W. R. Lake.—Dated 21st July, 1880.—(Not pro-ceeded with.)—(A communication from G. Eastman.) additional communication from Commu

2d. An upper reservoir containing the coating material communicates with the valve in a slotted tube, the stem of the valve extending outside for operating it. The plate to be coated is moved along under the slit in the tube, and receives an even layer of the emulsion or other coating material on its surface.

3009. ALLOYS OF NICKEL, A. M. Clark.—Dated 21st July, 1880.—(A communication from J. Garnier.)— (Not proceeded with.) 2d. This consists in mixing phosphorus with nickel so as to absorb the oxygen it contains after fusion.

as to absorb the oxygen it contains after fusion. **3019.** SAWING STONE, T. L. Varley.—Dated 22nd July, 1880.—(Not proceeded with.) 2d. The blades and their cutting parts or teeth are so formed as to be renewed by and through the wearing away of such blades. For this purpose the blades have semicircular, V, or other shaped portions cut out of the sawing edge at intervals. In the body of the blade and between these recesses or teeth are circular, diamond, or other shaped perforations, so that when one line of teeth is worn away, the perforations, by the wearing away of the blade, form a new set of teeth. teeth.

of teeth. **3022.** GLOVES, B. J. B. Mills.—Dated 22nd July, 1880.—(A communication from Messre. Holbrook and Ginet-Montgelas.)—(Not proceeded with.) 2d. The thumb, instead of being cut in the centre of the pattern or form used to cut the glove, is divided on the two exterior sides of the pattern, so as to make of the latter a form approaching to rectangular without any exterior projection, thus effecting a considerable economy in the extent of skin employed.

economy in the extent of skin employed. **3027.** SPINNING MIXED FIBRES, A. M. Clark.—Dated 22nd July, 1880.—(A communication from E. Agache and J. J. Inbs.) 2d.
A sliver is formed of a mixture of tow or flax combings and combed silk waste, by passing such mixture through the series of machines used for spinning flax, or through these used for spinning floss silk, and from this sliver through to say, by passing the sliver through a trough of hot water immediately before drawing it between powerful rollers, whereby the fibres are intimately mixed, and a smooth, supple and strong yarn produced.

3032. CIGAR CASES, C. Cheswright .- Dated 23rd July,

A case or receptacle to fit each end of the bundle of eigars is struck out of thin metal, and placed one over each end of the bundle, when the two are secured together by a metallic strip, leaving the middle part of the eigars exposed. 3063. MANUFACTURE OF SPIRIT, J. McGaan and W. O.

3063. MANUFACTURE OF SPIRIT, J. McGaan and W. O. Glassford.—Dated 24th July, 1880. 4d. The grain in the form of meal is digested under pressure in sulphuric acid diluted with water, in the manner understood, for the conversion of the starch of the grain into glucose. The contents of the boiler are run out and the acid neutralised with lime. The residue is separated and the liquor at once fermented by the addition of yeast, or it might be wine ferment, and by the addition also of a material upon which the ferment can feed. When the fermentation is com-plete the distillation of the wash is conducted in the usual manner.

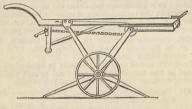
3092. ANTI-FOULING COMPOSITIONS FOR SHIPS'BOTTOMS, F. N. and E. G. Baird.—Dated 27th July, 1880. 4d. The composition consists of the admixture or com-bination with ordinary "metallic soaps" of various proportions of parafin, wax, or scale (or other similar products of parafin or petroleum).

3257. CHILLED ARTICLES OF STELL AND IRON, H. Springmann.—Dated 9th August, 1880.—(A commu-nication from C. F. A. Quensell.)—(Complete.) 2d. So as to impart to cast articles a maximum of

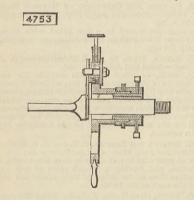
resisting power against dead blow or wear and tear, from 5 to 30 per cent. of cast steel is melted in a cupola or other furnace, together with pig iron, or an appro-priate mixture of grey and white pig iron—by preference, charcoal pig iron, or so-called cold blast. To obviate or remove any undue tension or strain in castings produced by pouring the mixture into cast iron or other moulds, such castings are removed from the moulds, when they have sufficiently set, to retorts or ovens suitable to give the whole casting a more or less dark red heat equally all over, then let it remain in this state for a length of time appropriate to its weight, and finally allow it to cool gradually.

4825. HAND TRUCKS or BARROWS, W. R. Lake.—Dated 10th November, 1880.—(A communication from E. J. Leyburn.)—(Complete.) 6d. This consists of a truck provided with supporting legs, one end of which is connected with the platform of the truck, and with their outer ends free, so that

4625



when the platform is fully elevated the free ends of the legs will be depressed into such a position that the said legs will constitute a firm support for the platform, and the truck will become self-supporting. 4753. DRESSING AXLE ARMS FOR WAGONS, J. B. Savage.—Dated 18th November, 1880.—(A communica-tion from R. R. Miller.)—(Complete.) 6d. This consists principally in a cutter head journalled



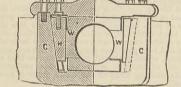
upon a bearing which is capable of being centred upon an axle arm, and provided with a cutter that is adapted to be moved radially upon or over the face of the said head, whereby the shoulders at the inner and outer ends of the said axle arm may be dressed, and its threaded end cut off.

SELECTED AMERICAN PATENTS.

From the United States' Patent Office Official Gazette.

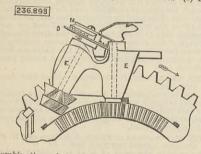
236,868. JOURNAL BOX, John H. Allen, Brooklyn. N.Y.-Filed November 18th, 1850. Claim.-In combination with the side pieces or side bearings W, of a journal box, the wedges H, provided with concentric inclined outer surfaces fitting against

236868.



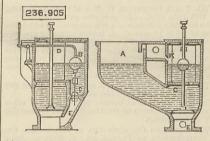
corresponding surfaces in the inside of the pillow block jaws G G, arranged in the manner and for the purpose substantially as described.

purpose substantially as described. **236**,8298. HARVESTER BINDER, Sylvanus D. [Locke, Hoosick Falls, N.Y.—Filed July 14th, 1879. Claim.—(1) The notched disc N, roughened or serrated on its flat under side, in combination with the plate O, or an equivalent thereof, and with the looping and tying head, substantially as described. (2) The vibrating cutter, combined with the rotating looping head, the fixed plate O, and the rotating disc N, notched at its edges and roughened or serrated on its under side, substantially as described. (3) The



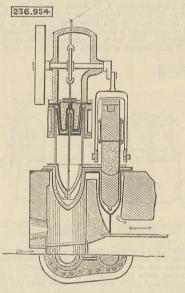
combination of the oblique shafts E.E. the inclined of croughened disc N, the fixed holding plate of the cutter, and the looping and tying head, by the state of the looping and tying head, by the state of the looping and tying head, by the state of the looping and tying head, by the state of the looping and the state of the state of

distributing box N, all made in one piece, as and for the purpose set forth. (3) The water box N, located between and having distributing outlets into the bowl and the outlet chamber. (4) A water receiver con-nected to the bowl and the outlet chamber, having an opening for a tube from the supply valve and dis-tributing outlets into the bowl and the outlet chamber, as and for the purpose set forth. (5) The water inlet K in the outlet chamber, in combination with a water distributing chamber, as and for the purpose set forth. (6) A valve fitted on the mouth of an overflow dis-charge pipe, and adapted to be seated at all times when water is at its regulated height, in combination with a valve seat having a guide attached to it to conduct the valve to its seat, and a float to open the valve if water increases in the receiver above a certain height. (7) The closet bowl A, the outlet chamber, and the chamber N, located between the closet bowl, sub-stantially as shown. (8) An overflow discharge pipe having a valve covering the mouth of it, and adapted to be seated at all times when water is at a regulated height, in combination with a valve seat having a guide attached to it, a spindle attached to the valve and operating in the guide of the valve seat, and a means for lifting the guide of the valve seat at an water increases in the receiver above a certain height.

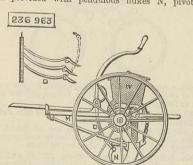


(9) In a side outlet water-closet, a partition placed in the outlet chamber or receiver above the neck of the bowl, in combination with an inlet into the receiver from the supply valve, and a port leading from the lower part of the receiver to the lower part of the closet, as and for the purpose set forth. (10) A water-closet bowl formed into a square shape at the top by the corners of the bowl, and having but one serviceable outlet. (11) In com-bination with the float B and lever D, secured to and operating on the support or stand, the rod or chain, as and for the purpose set forth. (12) In a water closet, wherein water is intended to remain at a regulated height, except at times when the closet is purposely empty, and wherein the mechanism is arranged to supply the closet upon the outlet valve being opened or reseated, an overflow discharge pipe with the mouth submerged, having a valve covering the orifice to form a water-tight joint, and adapted to be seated at all times when water is at a regulated height, in combination with a means provided to lift the valve from its bearing on the seat and permit the escape of any accidental accumulation of water. 236,954. AIR ENGINE, Azel Storrs Lyman, New York,

236,954. AIR ENGINE, Azel Storrs Lyman, New York, N.Y.-Filed June 22nd, 1880. Claim.-(1) An air engine having its working piston in the form of a plunger, one end of which projects from its enclosing cylinder where it is packed, com-bined with a generator, the plunger of which, acting merely as a displacer, is entiroly enclosed in its cylinder, with its heater below and cooler above, and with a small rod extending up through the cover for raising and lowering it, substantially as and for the speci-



fied purposes. (2) An air engine having its working piston in the form of a plunger, one end of which projects from its enclosing cylinder where it is packed, combined with a generator, the plunger of which, acting merely as a displacer, is entirely enclosed in its cylinder, with its heater below and its cooler above, and with a small rod extending up through the cover for raising and lowering it, the working piston being either loaded with weights or held down by the pressure of the air in a chamber opposite, so as to balance the high pressure and make it double-acting, substantially as specified.
233,963. GRAIN DRILL CLEANER, Daniel J. Shulls, Spruce Creek, Pa., -Filed September Sth, 1880.
Claim.-(1) The oscillatory hand apparatus consisting of the head or shaft, the times D, inserted in said head and provided with pendulous flukes N, pivotted

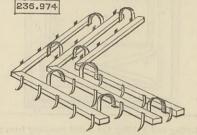


thereto and stopped, as set forth, in combination with the chairs on parts M_i or their equivalents, on the grain drill carriage, said times armed with said flukes being arranged to rake the spaces between the drills when operated by rearward sweeping motion, sub-stantially as and for the purpose set forth. (2) The connected manual drill cleaner composed of head or

shaft, tines D, flukes, and operating lever, the same being mounted transversely on the drill carriage in front of the seed trough W, having the ends of shaft journalled in chairs, and having said flukes sweep free of the ground, substantially as and for the purpose set forth forth. 236,974. FLEXIBLE HARROW AND CULTIVATOR FRAME,

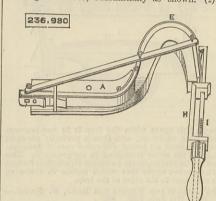
THE ENGINEER.

200.01.4. TRANSLE HARROW AND COLTIVATOR FRAME, Burr Bannister, Kalamazoo, Mich., assignor of two-thirds to Esek. W. Sleeper and Hale P. Kauffer, same place.—Filed July 19th, 1880. Claim.—A flexible harrow composed of a series of angular sections and connected by curved flat springs



interposed between the parallel bars, substantially as described. 236,980. MACHINE FOR BENDING WOOD, Edward L. Buckingham, Jefferson, Wis.—Filed December 10th,

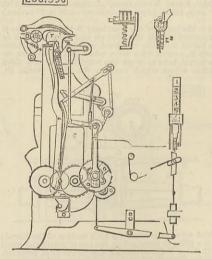
1880. Claim.—(1) A former A for bending wood, in combi-nation with the strap or straps E, having a plate or plates O secured to their ends, and a removable and adjustable hand lever provided with a hook and shoulder, substantially as described, and which is adapted to pull upon or force against the plate in bending the wood, substantially as shown. (2) A



hand lever for bending wood, consisting of a handle, the reversible screw hook I, and the part H, substan-tially as shown. (3) A lever for bending wood, consisting of a handle, the screw hook I, and the part H, having one or more grooves or flutes, substantially as set forth. (4) The combination of a band E for bending wood, provided with a plate O, having a hole through it, with an adjustable hand lever having a hook formed upon it to catch in the hole, and shoulder to bear against the piece of wood being bent, substan-tially as set forth.

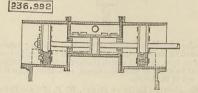
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tially as set forth.
236,990. Loom, George Crompton and Horace Wyman, Worcester, Mass., assignors to said Crompton.—Filed May 18th, 1880.
Brief.—The wedges or toes upon the vibrating arm engage with the inclines on the ends of the vertical arms of the three-armed selectors. The latter, mounted upon the shifting levers which carry the toothed cranks that connect with the shuttle-box operating levers, are operated by means of their rearwardly extending weighted arms and the fingers controlled by the pattern. Claim.—(1) In a loom, two or more shifting 236.990



levers, their toothed cranks and connecting rods adapted to operate the shuttle-box levers, the weighted selectors T pivotted upon the shifting levers, the fingers, the pattern surface to raise and lower them, means to operate the pattern surface, combined with a series of wedges or toes, a lever or arm to carry them, and means to actuate the said arm or lever and cause the wedges or toes to strike the arms of the selectors, as and for the purpose described. (2) The arm or lever E³, its rod, and wedges or toes mounted thereon, combined with the yielding bar, to permit the said wedges or toes to yield, as described.

236,992. AIR COMPRESSOR, John R. Cushier, Bellport, N.Y.-Filed July 20th, 1880. Claim.-In an air compressor, the combination of two single-acting end cylinders of equal diameter, and having open outer ends and two pistons therefor, a double-acting intermediate cylinder and piston, smaller in diameter than said end cylinders and



pistons, a common piston rod, an inlet valve or valves in each of the single-acting end pistons, a valve or valves for the passage of air from each end cylinder, to the smaller intermediate cylinder, and a discharge valve for each end or said smaller cylinder, substan-tially as and for the purpose specified.

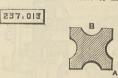
Feb. 25, 1881.

237,001. GRAIN DRILL, Willoughby P. Elam and Wilbur F. Boggs, Petersburg, Ill.-Filed April 27th, 1880. Claim.—(1) The drag bars G, hinged to castings and bifurcated, as shown, in combination with coller, fluke F, covering device, and stay rods, and with means K for elevating the gang, as specified. (2) The independent bifurcated drag bars G, hinged, and carrying revolving colter, flukes F, and presser foot, combined with a rod and with lifting frame K, through

237.001

which said rod operates loosely when said colter over-rides obstructions, as herein specified. (3) The com-bination of the independent bifurcated drag bars G, carrying revolving colter, flukes F, and presser foot, the rods, and lifting frame K, through which said rods work loosely, and spiral spring, as and for the purposes specified. (4) The double spiral feed tubes E, in com-bination with grain-box D, flukes F, and the feed bar or roll, as specified.

237,013. ROCK DRILL BAR, Henry W. Hammond, London, county of Middlesex, England — Filed August 19th, 1880. Claim.—As a new article of manufacture, a rolled



steel drill bar of the shape shown, having edges A and semicircular recesses B, substantially as specified.

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South KENSINGTON MUSEUM.—Visitors during the week ending Feb. 19th, 1881 :--On Monday, Tuesday, and Saturday, free, from 10 a.m. to 10 p.m., Museum, 9360; mercantile marine, building materials, and other collections, 2588. On Wednesday, Thursday, and Friday, admission 6d., from 10 a.m. till 4 p.m., Museum, 1237; mercantile marine, building materials, and other collections, 172. Total, 13,357. Average of corre-sponding week in former years, 14,315. Total from the opening of the Museum, 19,707,087. Epps's Cocoo.—Grattern, AND COMEDERING

from the opening of the Museum, 19,707,087. EPFS'S COCOA. —GRATEFUL AND COMFORTING. —"By a thorough knowledge of the natural laws which govern the operations of digestion and nutrition, and by a careful application of the fine properties of well-selected Cocoa, Mr. Epps has provided our breakfast tables with a deli-cately flavoured beverage which may save us many heavy doctors' bills. It is by the judicious use of such articles of diet that a constitution may be gradually built up until strong enough to resist every tendency to disease. Hundreds of subtle maladies are floating around us ready to attack wherever there is a weak point. We may escape many a fatal shaft by keeping ourselves well fortified with pure blood and a properly nourished frame."—*Civil Service Gazette.*—Sold only in packets labelled—" JAMES EPPS AND Co., Homœopathic Chemists, London."—Also makers of Epps's Chocolate Evsence for afternoon use.